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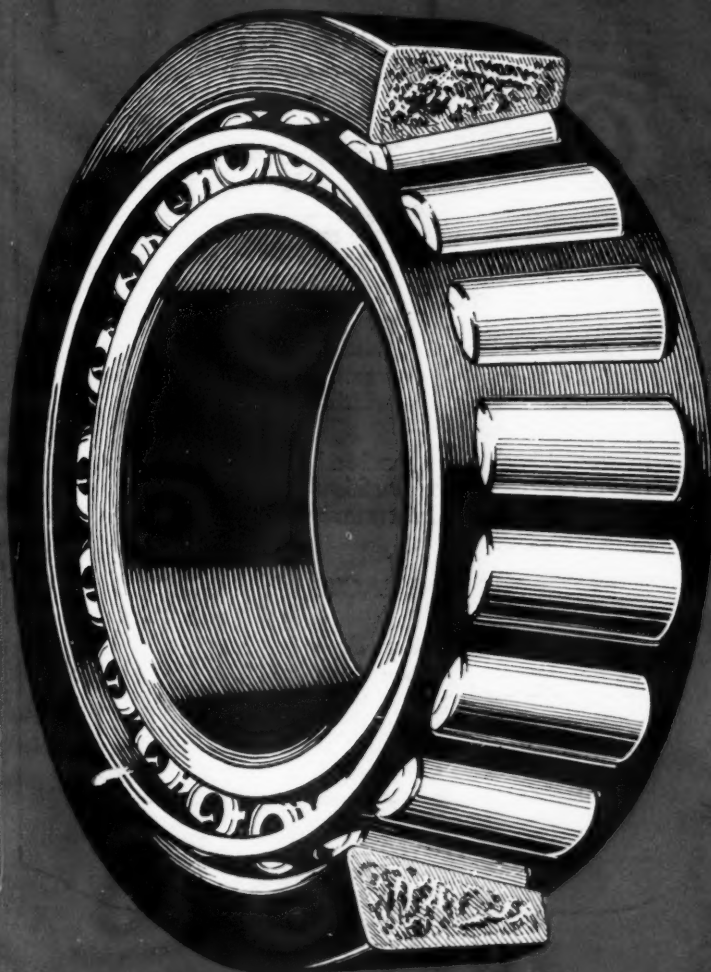
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AUTOMOTIVE INDUSTRIES

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VOL. L

NEW YORK—THURSDAY, MARCH 6, 1924

No. 10

Politically Articulate, Motor Car Owners Win Fight in House

Representatives always heed voices of constituents when they are raised in anger. Clancy's one man bloc victor. Same battle must be carried on in Senate.

By James Dalton

THE automobile bloc in the House of Representatives has scored a great victory in its fight for a reduction in automotive excise taxes.

Success is the more surprising because there was no such bloc until Dec. 10, and when it was organized it contained only one member. Its growth was amazingly rapid, however. Persons professing the Republican faith held rigidly aloof for a time, but latterly they were most anxious to join. So eager were they, in fact, that it almost seemed they wanted to take control of the machinery.

A bloc, it may be said, is not like a club. The one qualification for membership is possession of a Solon's mantle. No one who has that can be blackballed. He can't be kept out and he can take all his friends with him, provided they have the mantles.

Blocs were first grown in Europe and were transplanted to this country by the farmers. Their vogue has been due to the fact that a member of Congress is sensitized to public opinion to a greater degree even than an alderman. His constituents, though they be hundreds of miles away, have but to speak and he hears them. But, and here's another peculiarity, he's stone deaf to the voices of other men's constituents.

WHEN it comes to this uncanny ability to hear the voices of constituents there are no Republicans or Democrats in Congress, but only Candidates. The reason the automobile bloc grew to such large proportions in so short a space was that Republican members of the House began hearing voices almost simultaneously.

The voices all carried the same refrain. The possessors of them were all owners of motor vehicles. They had to pay so many different kinds of taxes, they said, that they had to keep engagement books lest they forgot dates with collectors and be haled to some kind of debtor's prison. Tax paying had become a habit and they had reached in their pockets automatically every time a State legislature met. They felt they had suffered in silence long enough.

UNCLE SAM, in the person of Secretary Mellon of the Treasury Department, disguised as Santa Claus, committed a tactical error, so far as motorists were concerned, when he advanced the astounding proposal that taxes, especially those of the income variety, could be reduced without sending the Government to the poor house. This project probably was as much of a shock to Congressmen as to taxpayers. Coming at the beginning of a Presidential year, it had to be considered in its political rather than its economic aspects.

The Solons must not permit their viewpoint to be warped by the probable effect of Mr. Mellon's recommendations upon business generally. The only point worth considering was how they could be made to affect advantageously the largest possible number of voters. For that reason it was felt on all sides he hadn't gone far enough in reducing the burden of the great mass of income tax payers and too far in aiding the minority who have much money in the commonly accepted meaning of the term.

But the Mellon plan permitted more than a drop

in income taxes. It would allow the abolition of the so-called nuisance levies upon such things as soft drinks, motion picture and theatrical admissions, bowie knives and jewelry. Here, again, the desires of the great mass of voters must be considered by their representatives.

It so happened that the sales tax upon automotive products returned a large sum to Uncle Sam. It approximated \$150,000,000 last year. But, as we already have pointed out, users of automotive products had acquired the tax-paying habit. They had failed to raise their voices in the only language Congressmen understand. It was felt that they would go on paying these excise taxes indefinitely without serious protest even though similar taxes were removed from other and less useful products.

Clancy Forms One-Man Bloc

It was then that Representative Robert H. Clancy, Democrat, of Michigan, conceived the notion of organizing his one-man automobile bloc. What followed constitutes the most interesting chapter in the political history of the motor vehicle.

Secretary Mellon makes a very satisfactory Santa Claus, generally speaking, but he has idiosyncrasies in respect to automotive products. His heart has been as hard as Pharaoh's when he has listened to appeals for lower levies upon them. He protested a year ago that they ought to be higher rather than lower because anyone who could afford to own and operate an automobile could afford to pay plenty of taxes. The motorist, both male and female, has paid and paid and paid; there's no doubt about that.

When Mr. Mellon decided, therefore, that income taxes could be reduced and nuisance levies abandoned, his purview did not embrace automotive products. They brought in a substantial revenue, and his only concession in this respect was to abandon his contention that they should pay more. Thus it was that when the bill was framed by the Treasury Department it simply reiterated the tax on cars, trucks and parts.

Committee Hearings Held

The bill went to the Ways and Means Committee of the House, which starts all revenue bills on their hectic careers, as an Administration measure. As such it had the support of the regular Republicans who constitute the majority of the committee.

As is its invariable custom, the Ways and Means Committee gave respectful hearings to all persons who felt their interests would be prejudiced by the provisions of the bill. The committee always feels that these hearings do no particular harm. They permit the public to become articulate, but no attention whatever is paid to the arguments presented unless it is apparent that the speaker is likely to go out and make himself disagreeable by getting constituents to raise their voices.

When the automotive excise tax sections of the bill were reached some of the reasons why they were unfair and discriminatory were outlined briefly by representatives of the National Automobile Chamber of Commerce, the

Motor and Accessory Manufacturers Association, the Automotive Equipment Association, the Automotive Electric Association, the Automobile Body Builders Association, the Rubber Association of America, the National Automobile Dealers Association, the American Automobile Association, the Society of Automotive Engineers and other organizations.

The spokesmen for the industry outlined patiently why a tax on a truck is a tax on transportation and why a tax on a repair part is a tax on misfortune.

Taxation Burdens Heavy

They mentioned the heavy burden of taxation, national, State and local, which motor vehicle owners carry. They suggested mildly that it seemed a bit unfair to take excise taxes off almost every other product and leave them on motor vehicles and parts. They pointed out that there are about 15,000,000 persons in the country who help pay all these imposts.

The spokesmen were heard politely but the only ripple of interest they evoked among Republican members was the reference to 15,000,000 citizen motorists, most of whom probably were voters. But it was felt the 15,000,000 never had made their voices heard politically and probably wouldn't.

Therefore, when the bill came to a vote, the majority, being good Republicans and naturally anxious not to go counter to the wishes of the Administration, followed the presumptive advice of Mr. Mellon and left the automotive sections exactly as they were.

Meanwhile, knowing what would happen in the committee, the one man automobile bloc composed exclusively of Mr. Clancy, had

not been idle. As a representative of Michigan he was familiar with the affairs of the industry. He was honestly convinced that retention of the automotive excise taxes when all others were being removed or reduced was distinctly unfair and discriminatory.

Mr. Clancy is not unfamiliar with the intricacies of politics. He knows all about the voices which Congressmen must hear before they can be convinced. He also is an officer of the Democratic Congressional Campaign Committee. He is not unaware of the fact that the automotive industry has been classed in the past as Republican in its leanings. Ten weeks ago he was able to visualize what would happen if any respectable fraction of the 15,000,000 motorists of the country would raise their voices so their representatives could hear them.

With his convictions, his vision and his political astuteness, Mr. Clancy had no great difficulty in adding the Democratic members of the Ways and Means Committee to his bloc. Under his leadership they vigorously espoused the cause of automotive excise tax removal or reduction. He made a ringing speech on the floor denouncing the majority for deserting the nation's greatest industry and in support of the bills he had introduced for the removal of all the automotive excise levies.

The associations representing various branches of the

THE House of Representatives has voted a reduction of \$24,000,000 a year in automotive excise taxes, but this relief is of minor importance compared with the fact that the automotive industry and the motor car owners of the country have won the first real political battle they ever waged.

Because the campaign which has been carried on for the past two months awakened the political consciousness of the nation's motor vehicle owners, AUTOMOTIVE INDUSTRIES believes this detailed account of what has been accomplished is worth while.

What has been done can be done again. The present contest must be renewed in the Senate and the conference committee which finally will write the revenue bill. Similar struggles against unjust exactions may become necessary at any time.

industry and the nation's motorists rallied around Mr. Clancy and gave him their whole-hearted support. They had argued consistently for three years for tax relief and their arguments were irrefutable, but they made no progress for the simple reason that the voices which Congressmen dread were not raised in their support.

There was only one sure way to get action in Congress and that was to stir up constituents so they would raise their voices. Appeals were sent to all the members of all the organizations to write or wire their representatives demanding excise tax relief. The A. A. A. went after the motorists. The N. A. D. A. went after the dealers and the dealers went after their customers. Every member of Congress was bombarded daily with striking literature telling briefly and pointedly the ways in which motorists are overtaxed.

Then the Farm Bureau Federation and the National Grange were given facts and figures demonstrating that automotive excise taxes cost the farmers of the country \$45,000,000 a year. That swung the farmers into line and the farmers are thoroughly familiar with the best methods of making their voices heard on Capitol Hill.

Early in the struggle it was decided it would be useless to make a serious demand for entire removal of the automotive imposts. Inasmuch as the levies against trucks and parts are least defensible, the attack was centered on them.

Effective use was made of the slogan that a tax on repair parts and accessories was a tax on misfortune and so hard was this contention hammered home that proponents of retention of a 5 per cent tax on them hadn't a leg to stand on. It was agreed that if this levy could be cut in two and made 2½ per cent it would be a long step in the direction of getting rid of it altogether in addition to meaning a direct saving of \$20,000,000 a year.

There is even less excuse for a tax on a light truck than on a heavy duty vehicle and the managers of the campaign decided to concentrate on relief for them. It was found that the chassis of nearly 90 per cent of all the truck units made sell for \$1,000 or less and the loss of revenue from this source would be only \$3,600,000, or a mere drop in the national revenue bucket, if the tax were removed entirely. It was certain there would be less sympathy for a move to relieve heavy trucks because a great many farmers and others still believe they tear up highways to an unwarranted degree.

This \$24,000,000 in relief was agreed upon as the irreducible minimum which would be asked of Congress.

Farmers Raise Their Voices

The literature which was being fired at members of the House was followed up by personal calls and direct arguments in as many cases as possible. In the beginning the results of these presentations appeared to be negligible.

Soon, however, Congressmen began to hear voices. The farmers, who never have acquired the habit of paying taxes silently and with resignation, were the first to act. They knew exactly what to do. They protested to

the representatives of their own districts and to the representatives of their organizations in Washington who acted promptly.

Then the motorists raised their voices. Louder and louder rose the chorus. Congressional mail assumed alarming proportions. Messengers and pages were trotting around all the time with telegrams. They all told the same story—indignation at the retention of automotive excise taxes when they were being removed from nearly all other products.

Political Consciousness Aroused

For the first time in history the political consciousness of the motorists of the country had been aroused and they had become vocal.

Mr. Clancy's automobile bloc grew larger by the day and almost by the hour. Representative Garner of Texas, a potent factor in the Democratic ranks and the author of a plan of his own as a substitute for the Mellon plan of income tax reduction, saw possibilities in an alliance with it. The same was true to a certain extent of Chairman Green of the Ways and Means Committee who didn't like the Mellon bill any better than Garner, but who voted for it chiefly to get it out on the floor, where it could be shot full of holes.

In the meantime, Representative McLaughlin, Republican, dean of the Michigan delegation and a member of the Ways and Means Committee, had seen the light. He concluded that the minimum automotive tax reduction program agreed upon was no more than fair. Mr. Clancy, being a good politician and knowing he could count on Democratic support anyway, agreed that he would not press his bills for total abolition of the taxes if Mr. McLaughlin would offer an amendment to the automotive sections of the pending bill providing for the dropping of

the levy from trucks costing \$1,000 or less and for a cut of 50 per cent in the tax on repair parts and accessories. He found it would gratify Mr. McLaughlin to do just that.

Then treasury experts and Old Guard Republicans began to shoot holes in the Garner plan and protest that if it went through there wouldn't be revenue enough to run the Government. Mr. Garner scoffed at these insinuations, but when he was in the quiet of his office he scratched his head and decided it would be a good idea to dig up a couple of serviceable revenue producing ideas.

One of the projects which come to Mr. Garner's mind was a Federal tax on inheritances which would confiscate a considerable portion of large estates, and a little higher tax on cigarettes would bring in something like \$60,000,000. If he could have these amendments written into the bill he was perfectly willing to stand by the automobile bloc in having \$24,000,000 lopped off automotive taxes.

It should be remarked, more or less parenthetically, that the House gave Mr. Garner his inheritance and cigarette taxes and when the final vote came he was in the automobile bloc.



Representative Robert H. Clancy, leader of the fight in the House for reduction in automotive excise taxes

The voices reached a crescendo at the beginning of last week. Makers, sellers and users of motor vehicles were demanding consideration. They had no desire to be unreasonable, but it was a matter of principle with them. With almost every one getting tax relief they wanted a little for themselves.

They got it, for the simple reason that they became articulate in their protests.

While demands for action poured in from outside, Representative Clancy argued and cajoled inside the House. He is not a simple, trusting soul. He doesn't believe everything he hears and thus it was that he was skeptical of success even 24 hours before the automotive sections of the bill came up for debate on the floor. Although he had made his plans carefully, he was suspicious that some one would attempt to "put something over" on him. Several did. While he won his fight for tax reduction, much of the credit for it was stolen from him by the Republican majority and he was shamefully steam rolled.

Those persons who are interested in motor vehicles are not likely to forget, however, that it was Mr. Clancy who championed their cause when it had few friends in the House and that but for the fight led by him the auto-

motive sections of the tax bill would have been left exactly as they were when the measure was reported by the Ways and Means Committee. The Republicans voted for reductions, but it was only after it had been demonstrated unmistakably that the motorists of the country were demanding them.

While the first major skirmish of the battle has been won and the motorists have a technical advantage, they must keep up their sledge hammer blows. The scene of conflict now shifts to the Senate, which soon will begin consideration of the revenue bill as passed by the House.

Senators are not quite so sensitive as Representatives to the voices of constituents, but their hearing is keen. It always is keener in a Presidential year. The voices which were heard by members of the House must now be raised so they can be heard in the upper chamber.

Senator Edge of New Jersey has introduced the Clancy bills in the Senate and he will lead the fight there. If he is to succeed he must be given exactly the same kind of support from the outside as went to Mr. Clancy.

When the Senate gets through tinkering with the revenue bill the House will be unable to recognize its child. The distinguished gentlemen at the other end of the Capitol also have sharp political bowie knives.

Scandals, Follies and Verities of 1924 in Washington

"If the 15,000,000 motor vehicle owners of the country remain inarticulate, like oysters, they deserve to be eaten."—From the political observations of Representative Robert H. Clancy of Michigan, who led the fight in the House for automotive excise tax reductions.

POLITICAL Washington is leading a hectic life. Its ear drums have been almost shattered by explosion after explosion on Capitol Hill. Each succeeding detonation becomes more deafening and the casualties have been terrible. Reputations are being blasted every day. Even innocent bystanders, if there are such in politics, are not immune. If it becomes known that you once had luncheon or played pinochle with some man blown to bits in one of the explosions, you are doomed, and you might as well retire to private life before you are retired involuntarily.

THERE are three schools of thought in Washington: Those who believe everything they hear; those who believe nothing they hear, and those who don't care a hang what they hear. The transients, to whom politics is more or less of a business, make up the first two schools, while the permanent residents, who have seen administrations come and go and have to make their own livings, compose the third class. They are much more interested in new schools and better streets than in what happens to "carpet baggers" who come for a brief space and then vanish into oblivion.

INVESTIGATION of the oil leases is about 90 per cent political. The legality of the transactions and whether or not the Government got a good bargain, either from Sinclair or Doheny, are being given mighty little consideration by the investigators. Those questions can all be settled later in the courts, but this is a Presidential year and all the explosives must be extracted from the situation immediately or they will lose

their political effect. The campaign undoubtedly will be over before validity or invalidity of the leases can be established in the courts. A good many persons believe the Government got the best of the bargain, especially in the case of Sinclair. It seems to have been pretty well established that oil was leaking out of the reserves and they probably would have been exhausted before Congress could agree to let Uncle Sam undertake drilling operations.

THOSE in the conservative school of thought contend that if Fall had told the exact truth when he was on the witness stand there wouldn't have been any oil scandal. They hold that if he had answered all the questions of his inquisitors and then volunteered a supplemental statement about his relations with Doheny, all would have been well with him. He might have said something like this: "There is something else I would like to say to you, gentlemen. When I retired to private life and attempted to rehabilitate myself on my ranch in New Mexico, I found I needed \$100,000. I went to my life-long friend, E. L. Doheny, with whom I worked as a pick and shovel miner many years ago, and he loaned me the money. I fully expect to repay him as soon as I am able."

ON the other hand, those in the radical school assert it was Fall who put the "sin" in Sinclair and took the "dough" out of Doheny. They are clamoring for indictments, criminal prosecutions and Federal penitentiary terms. On the surface, the weight of the argument seems to be with them, but it must be remembered that the worst possible constructions are being placed on conferences, transactions and negotiations which may have been entirely innocent in their inception. Both the great parties are seeking political ammunition. The Democratic arsenal has received the larger stock up to this time, but the end is not yet.

If the Senate retains the automotive tax reductions voted by the House the battle will have reached only its second stage, for the bill then must go to the conference committee, which will slash and prune and add and subtract before it will be submitted in final form to both houses.

Eagle eyes must watch that conference committee to see that it doesn't backslide on the automotive sections. It probably will be three months before the conference report is ready for submission. By that time the national conventions of both parties will be near at hand and it can be accepted as immutable that Congress will adjourn before the chairman's gavel falls at either.

In its closing days Congress will be in its usual apparently hopeless snarl. After dawdling along for months it will find that the appropriation bills haven't been passed and that Uncle Sam will have to declare a moratorium unless he is supplied with funds. Then the revenue bill and the appropriation bills will be jammed through with little or no consideration.

Unless the reductions voted by the House are retained in the measure as revised in conference, there will be absolutely no chance of their consideration when the present session begins writhing in its death agonies.

The Board of Strategy which managed the campaign in the House for lower excise taxes will meet in Washington in the near future to map out a plan of campaign for the rest of the battle. This board is composed of representatives of all the organizations which have entered the lists. They will decide upon the cooperation they will ask from the members of their organizations.

Unless this cooperation is forthcoming the bugles might as well sound the retreat. Politics is Argus-eyed and never sleeps.

If this fight for tax reduction finally is won, the greatest part of the achievement will not be the \$24,000,000 which has been saved to the motorists of the country. That is a comparatively minor detail.

The outstanding feature of the victory will be that the automotive industry and the motorists of the country have become politically articulate. They will have learned how to fight shoulder to shoulder for their just deserts. They will have impressed their personality upon Congress and once Congress has heard the voices of its constituents it never forgets.

When the 15,000,000 motor vehicle owners of the country have learned to stand together they need no longer suffer from unjust and discriminatory impositions.

Distinguished Cast Presents Sensational Political Melodrama

CONGRESS is suffering from "investigation fever" and is running a distressingly high temperature. Each probe provides new fuel for the internal fire. The orgy of inquiry hasn't really started yet. The Internal Revenue Bureau is expected to provide one of the most succulent morsels. It will be amazing if a few scandals can't be pried out of it. Thousands of tax adjustments have been made, and if it is found that a few men of wealth, against whom the Government had huge claims, have settled for a tithe of the amount originally demanded, it is easy to see what the presumption will be. Even though a transaction may have been entirely legitimate it will be made to appear exactly the reverse.

WHETHER or not all these investigations will accomplish anything of a constructive nature remains to be seen. Judging by precedent, they won't get beyond the reputation blasting stage. There is one scandal which could and should be stamped out, however. It is what might be termed "the tipping evil." There are well defined leaks in almost every Government department, commission, board or bureau, which has to make decisions which will affect the prices of commodities or stocks. These "tips" are peddled in the quarters where they will do the peddlers the most good. The information given is authentic and a few hours' advance knowledge of a decision which will send prices up or down will permit the possessors of the knowledge to profit in proportion to the amount of money they have to invest.

THIS "tipping" custom presents one of the nastiest phases of the oil scandal. There appears to be little doubt that Fall had a full comprehension of the effect the granting of the Sinclair lease would have on the Sinclair oil stocks and that he gave his friends in official Washington a quiet tip on how to bet on a sure thing. To their credit it should be said that few of them took advantage of this advance information. Those who did

buy as a result of Fall's tip were not guilty of anything criminal, but their action certainly was not ethical. Public office should be regarded as a public trust, but it frequently isn't.

IF Attorney-General Dougherty finally resigns, as he undoubtedly will, his passing will not be viewed altogether with regret by the business interests of the country. One of his favorite pastimes has been the prosecution of trade associations. Some of them have deserved prosecution, but he seems to have been unable to differentiate between the good and the bad. His undeviating opposition to the collection and dissemination of information concerning the production and distribution of merchandise has fallen little short of persecution. His ideas and those of Secretary of Commerce Hoover on this subject have been as wide apart as the poles. Incidentally, it may be said that there is little probability of Mr. Hoover accepting any Cabinet portfolio other than the one he has. He hasn't accomplished as much as he had hoped, but it has been because of opposition born of politics.

WHILE the Senate is scandal hunting, the House will take up Henry Ford's offer for Muscle Shoals, and it is likely to create fully as much of a stir as anything which may be unearthed at the other end of the Capitol. Indications now are that the House will approve the Ford proposal at the present session, but that the Senate will reject it. Power, fertilizer and chemical interests naturally are bitterly opposed to acceptance of the Ford offer, because his development of the water power in the Tennessee would bring him into competition with them and they are not without friends in the Senate. If he wins the approval of the House, however, he will have a tactical advantage, and it is the opinion of those best informed that Muscle Shoals ultimately will be turned over to him.

L.G.O. Subsidiary Adds Two-Ton Truck to Present Line

Associated Equipment Co. announces new vehicle designed to operate with low maintenance costs. Engine has barrel type crankcase, inserted cylinder sleeves and ball bearing crankshaft. Is first English product of this class to employ battery ignition.

By M. W. Bourdon

THE Associated Equipment Co., Walthamstow, London, the manufacturing subsidiary of the London General Omnibus Co., has put into production a new chassis for net loads of two long tons with 20 per cent overload permissible, thus supplementing a range of heavier types which include the 8-10 ton tractor described in *AUTOMOTIVE INDUSTRIES* of Dec. 13 last.

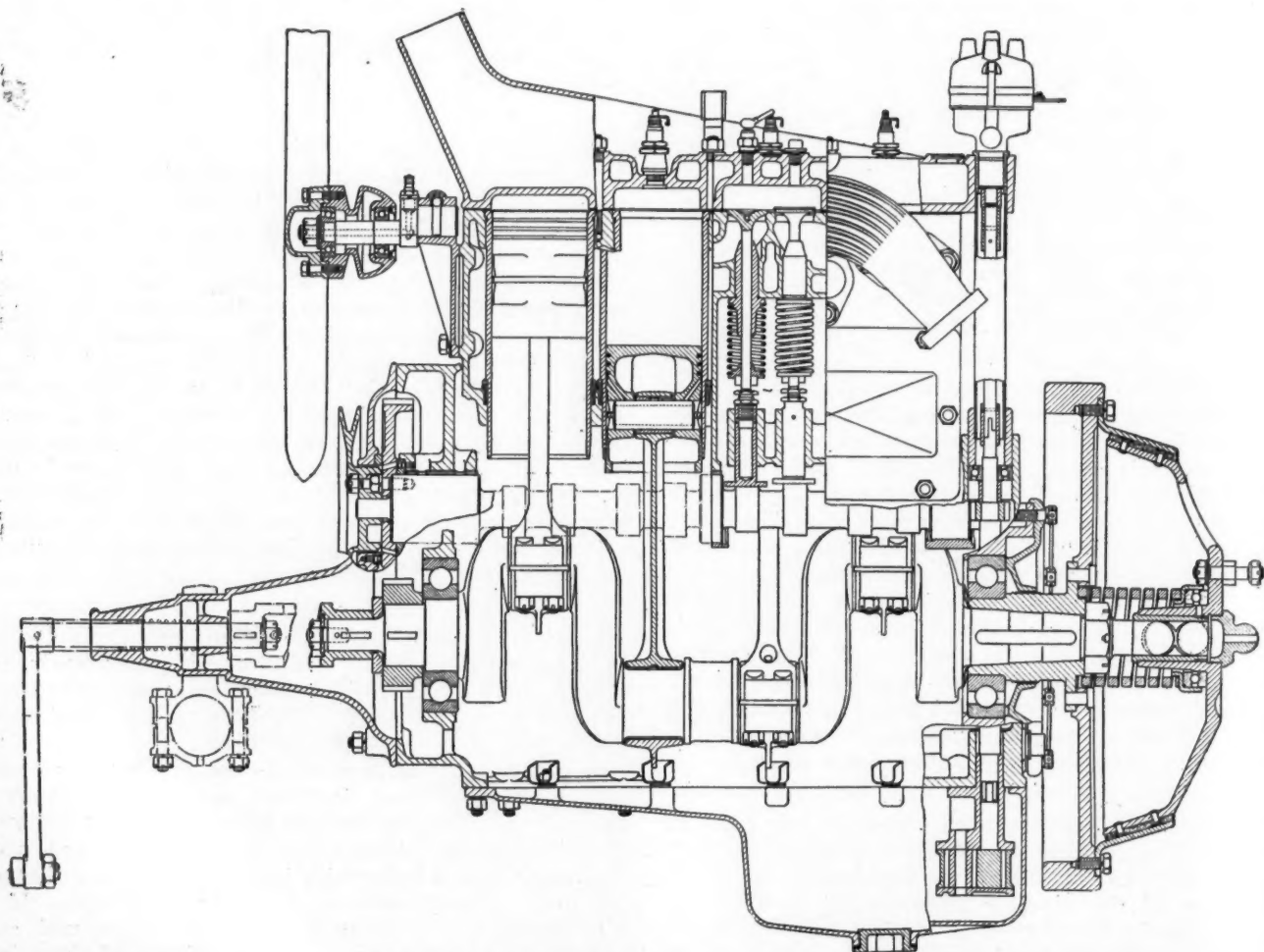
Taken together, the A. E. C. bus and truck chassis form the largest output of any commercial vehicle manufacturer in England. In introducing the new two-tonner the makers have been able to offer the chassis at a price which compares favorably with similar types of British trucks. This has not been accomplished by departing from high

standards of accuracy and finish but by lowering production costs more than most British firms.

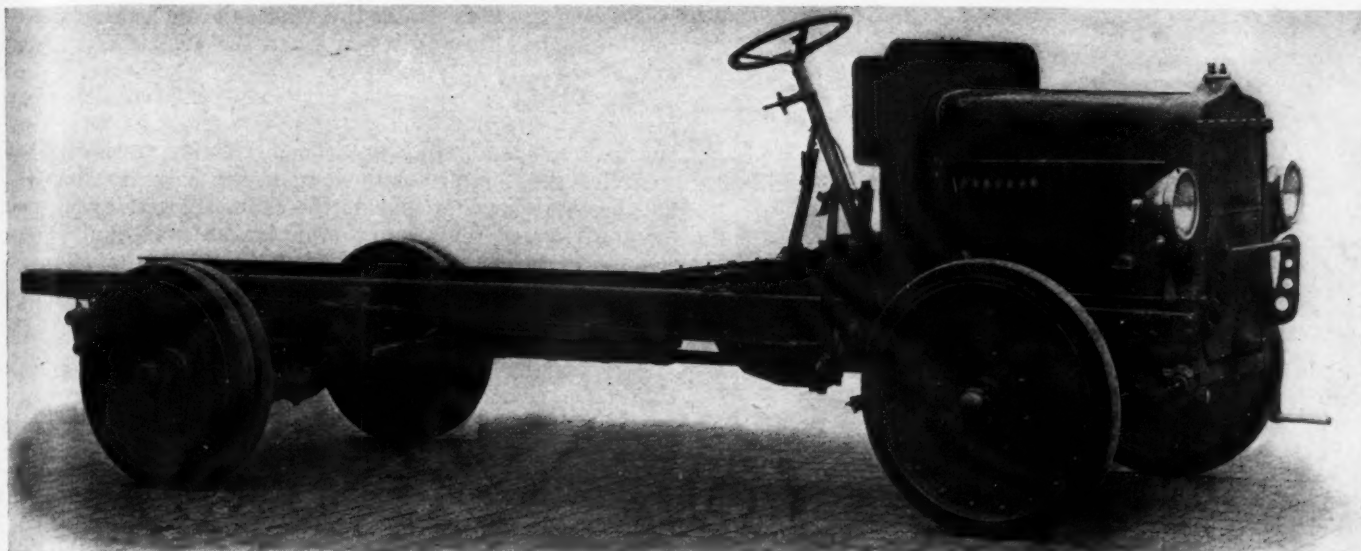
In designing this model it has been considered that low maintenance costs and ease of upkeep are of equal importance, if not even more important than low first cost. The result is seen in numerous unusual features referred to below.

The frame has two parallel side members of pressed steel 7 in. deep for the greater portion of their length and 2½ in. wide. There are four tubular and one pressed steel cross members.

A 3 15/16 by 5½-in. engine which develops 30 b.h.p. at 1000 r.p.m. is employed. It is supported at three points.



Longitudinal section of A. E. C. two-ton truck engine with barrel type crankcase, inserted cylinder sleeves and ball bearing crankshaft



New A. E. C. two-ton truck chassis, produced by makers of L. G. O. buses

Integral bearer arms extend from each side of the rear end of the crankcase to the frame members, while a bracket clipped to the front cross member forms a single trunnion support. The trunnion ring encircles the tapered tubular extension of the cast steel cover of the front-end drive. After removing the radiator and dismantling the clutch coupling the engine as a unit can be

lifted out of the chassis without disturbing any other main component.

Fifteen 7/16-in. studs and nuts secure the detachable head to the cylinder block, which is formed with the whole of the crankcase as a unit in cast iron. The bottom of the main casting has merely an aluminum oil sump. The rear opening of this barrel type crankcase is inclosed by a flange plate which houses the rearmost of the two main ball bearings of the crankshaft. This bearing is 6 3/4 in. in diameter and the front bearing 6 1/4 in. in diameter. Both have 3/4-in. balls.

Crankshaft pins are of 2 7/8 in. diameter. The taper on the rear end of the crankshaft carries a flanged sleeve for flywheel mounting. A return thread tends to prevent oil leakage.

The front-end drive consists of a train of skew gears 1 1/4 in. wide. Three plain bearings of 2 3/4 in. diameter support the camshaft.

Inserted cast iron cylinder sleeves are employed. The top water joint is made by the cylinder head gasket. Water ports in head and cylinder block are all jig drilled. The packing at the bottom of the cylinder barrels consists of two units, the first a deep rubber ring and the second a contracting metal ring which maintains a constant end pressure upon the other unit. Provision is made for access to these joints by arranging the water inlet from the radiator along almost the full length of the cylinder block on the right, the water manifold being a separate unit covering an opening in the block 3 1/2 in. deep.

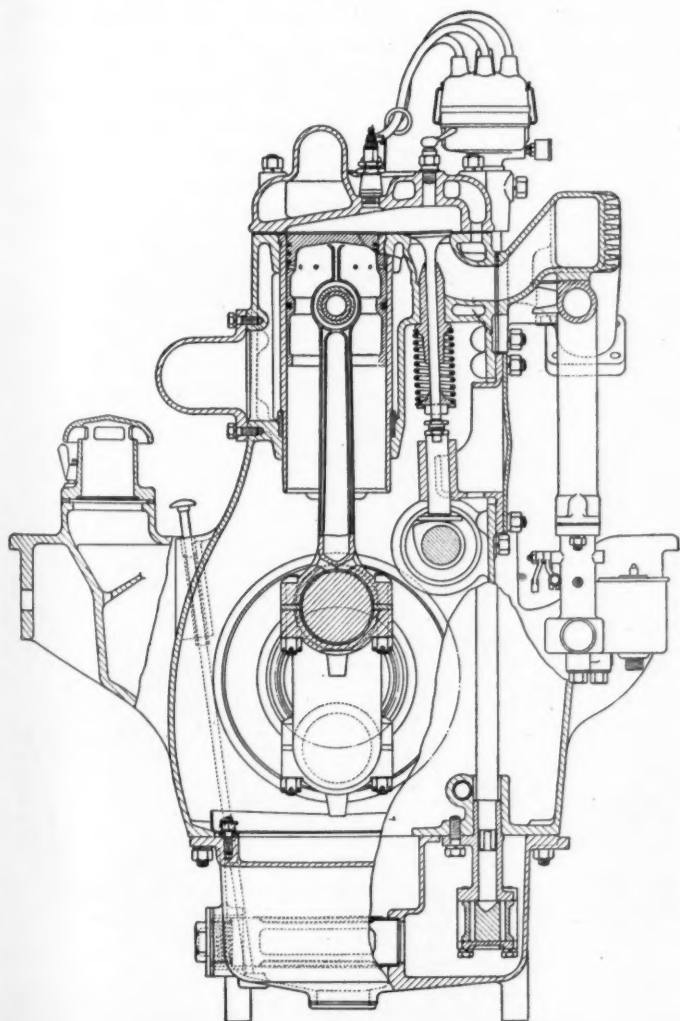
Sparkplugs are set over one side of the cylinder bore in the center of the head.

Chrome Cobalt Valves Employed

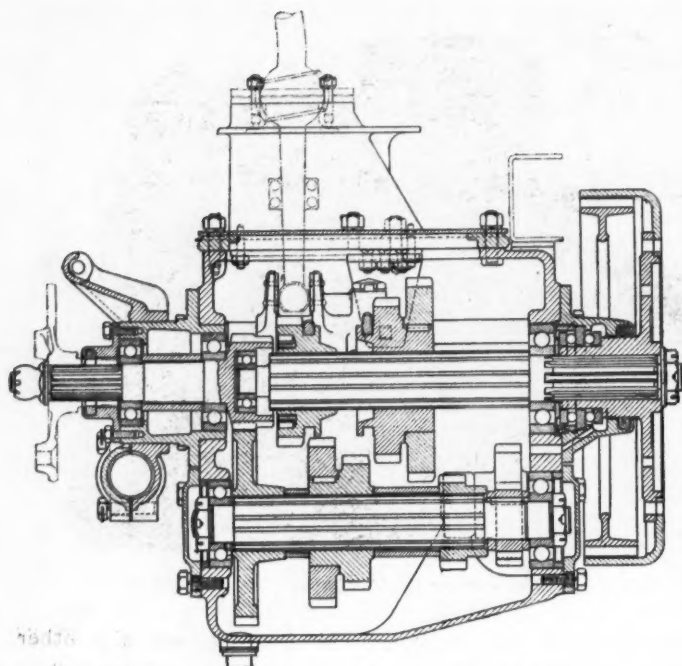
Valves are of chrome cobalt steel and are operated by mushroom followers with the usual adjustment. Valve guides are separate from the cylinder block and give a bearing length of 4 in. Overall diameter of valve head is 1 3/4 in. Stems are of 3/8 in. diameter.

Tappet guides are cast as a single detachable unit which, when in position, leaves a clear space between it and the cylinders to allow oil mist to reach the valve stem chamber. The latter is inclosed by cast iron cover plates.

A circulating splash system of lubrication is employed. There are troughs under the big-ends having provision for height adjustment where they are attached to the aluminum sump. The submerged gear oil pump is driven



Transverse section of A. E. C. engine, showing large inlet water header



Four-speed gearset used on A. E. C. two-ton truck chassis. Note location of brake

by helical gearing from the camshaft. The sump communicates with the pump chamber through a port closed by a $6 \times 1\frac{3}{4}$ -in. cylindrical strainer easily removable for cleaning. There is a direct oil lead to the front-end gears. These gears can be inspected or replaced without lifting out the engine. Provision is made for allowing the removal of the front-end cover and its extension without disturbing anything except the radiator.

The pistons are of aluminum with three compression rings in the head, the lowest also forming a scraper. A fourth ring is placed in line with the hollow floating wristpin and serves to locate the latter axially. The wristpin is $1\frac{1}{2}$ in. in diameter, while the connecting rods and pistons are respectively $11\frac{7}{8}$ in. and $5\frac{1}{8}$ in. in length, each of the rods having four bolts.

Battery ignition is used, this being the first British truck so equipped. The generator is driven directly from the front-end gears. It is located alongside the crankcase on the left, while the distributor is mounted above an extension of the rear end of the cylinder head, driven by helical gears and a vertical shaft from the camshaft.

Thermo-Syphon or Pump Circulation

Normally, a four-bladed cast aluminum ball bearing fan and thermo-siphon water circulation is depended upon for cooling, but chassis for export to tropical and semi-tropical countries can have a pump fitted, provision being made for this in the design.

An inverted cone clutch lies within a bolted-on extension of the flywheel, the driven member being connected to the main shaft of the separate gearset by a short coupling shaft having fabric disk joints. To allow the thrust from the disengaging sleeve to be taken through the front joint and also to relieve the disks of the weight of the coupling as a whole, the spiders are supported and centralized by spherical bearings.

The four-speed gearset has a central shift lever and an internal gate with a safety catch for the reverse. The gearbox consists of a main casting with three large openings, viz., at the top and each side. The opening on the left is provided to allow the fitting of a power take-off attachment for operating a tipping body, cable drum or lifting tackle. For these auxiliary purposes the third-

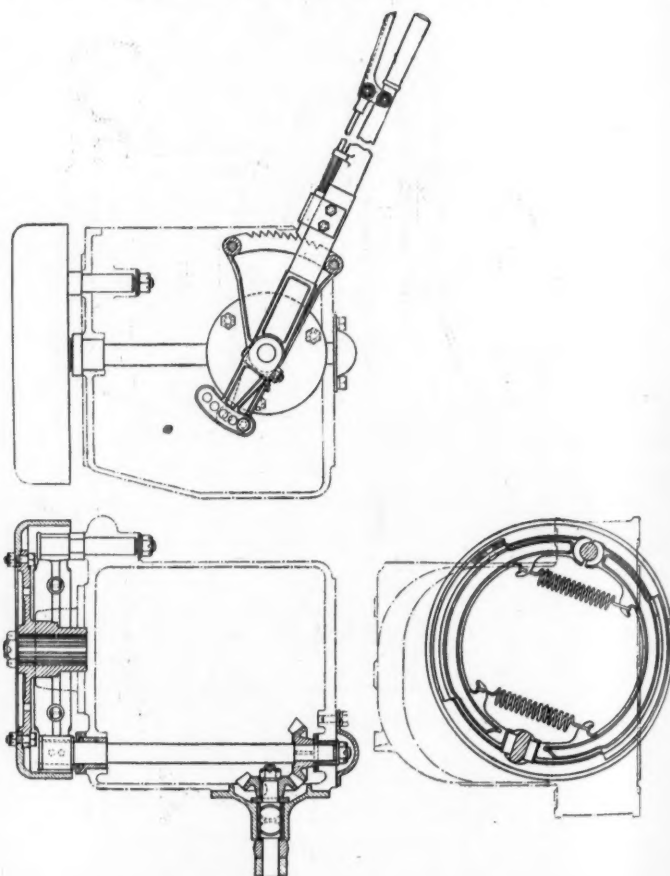
speed gears are used and the whole of the engine power can be applied through them when the vehicle is stationary.

The gearset is suspended at two points from the only pressed steel cross member of the frame. At the front end, a bracket standing up from a tubular cross member encircles the forward extension of the case housing the ball bearings at that end of the main shaft, an arrangement giving a single point trunnion support that allows some latitude in the positioning of the tubular cross member.

Ball Bearings Used in Gearset

Ball bearings are used throughout the gearset, except the roller bearing for the single pinion on the reverse layshaft. A double-thrust washer is placed at the rear end of the secondary shaft. Here, and also at the front end of the box, return screws and felt glands are provided to prevent oil leakage. To facilitate individual renewals, all the case hardened pinions are separate units, the central pair of pinions on either shaft having the unit of largest diameter keyed to the other.

Clutches with which the lower end of the gear lever engages have hardened steel facings riveted on so as to permit any slackness that may occur here on account of wear to be taken up without necessitating renewal of the main part. Gear selectors are tubular and are mounted on round stationary guide shafts which have concentric grooves for the spring-loaded locating plungers. These shafts can be partially rotated when wear of the grooves has occurred at the points where the plungers initially engage. The shafts run the full length of the box and can be adjusted endwise to locate the grooves for centralizing the engagement of the pinions. The interlocking device consists of a steel ball projecting from each side of a plate between the two selector rods.



Bevel gear mechanism used to operate gearset brake on A. E. C. two-ton chassis

An opening on the right side of the gearbox is inclosed by a plate with a boss and bearing for the hand brake lever shaft. The brake operated by this lever is located at the rear end of the gearset and is of the expanding shoe type. The brake camshaft runs through the gearbox from end to end and is connected to the lever shaft by a pair of bevel pinions.

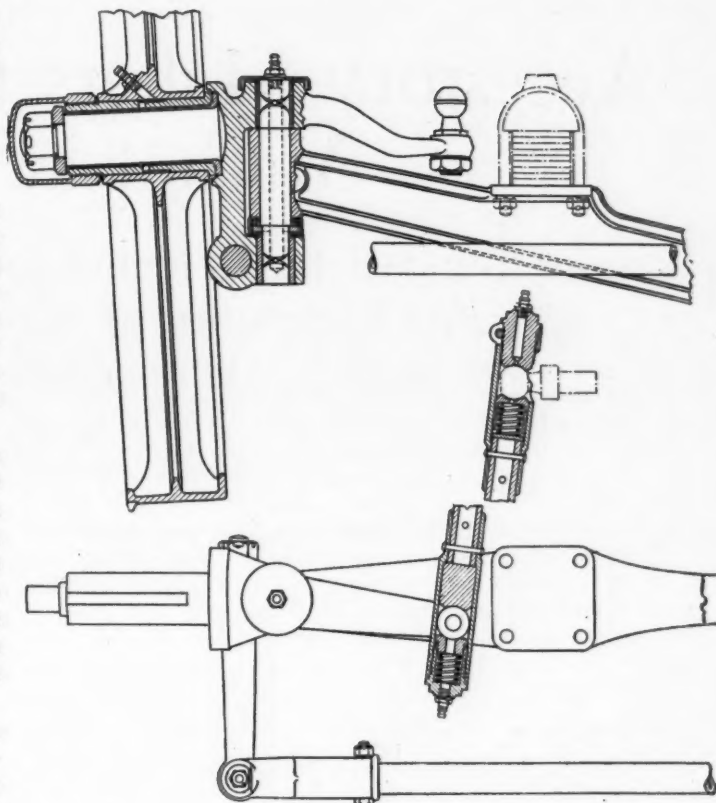
An extension below the hand brake lever is formed as a quadrant with five holes through it to enable it to be secured at various relative angles to a lever attached to the shaft. By shifting the coupling bolt into another hole in the quadrant a service brake adjustment can be made. When this has been done, partial withdrawal of the cover plate and lever shaft permits the bevel pinions to be engaged at fresh points, a tooth or more in the required direction.

To overcome the usual objection to an internal brake behind the gearset—difficulty in renewal of the shoe facings—the shoes are made readily accessible and can be removed for refacing after unscrewing six nuts which hold the brake drum to a flange on the gearshaft. The drum slides back over the propeller shaft so that the shoes can be lifted away when the retractor springs have been unhooked. The brake drum is 13 in. in diameter, the shoes having friction facings 2 in. wide. They are pivoted on a short stud projecting from the gearbox.

Advantages claimed for this brake are the elimination of exposed bearings and couplings, the continuous lubrication of all wearing parts except the brake cam, rigidity of the shoe anchorage and camshaft, plus the benefit in manufacture of having the gearset and complete brake assembled as a unit.

From the gearset the drive is conveyed through an open propeller shaft and two inclosed Spicer joints. The main length of the shaft is tubular, 3 in. in diameter, secured to solid ends by $\frac{3}{8}$ -in. rivets and welding. The front solid end is splined and lubrication of the splinings is effected by oil within the front universal joint casing. An adjustable packing gland at the rear end of the splined sleeve prevents oil leakage.

Overhead worm gearing forms the final drive. The worm shaft is supported by tapered roller bearings, while the straight pinion differential is mounted on ball bear-



Front axle, showing section of knuckle and plain wheel bearing

ings and has ball thrusts. Renewable hardened steel sleeves are fitted over the ends of the rear axle so that the latter shall not be subjected to wear from the wheel bearings, which are of the floating bush type. The drive shafts have splined ends, the outer of which convey the drive through flanged caps bolted to the wheel hubs.

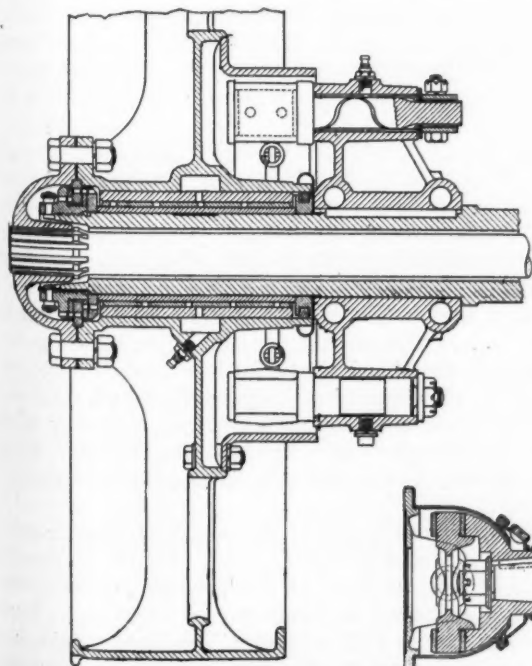
Rear brakes are operated by pedal and are equalized. The shoes are interchangeable with those of the transmission brake.

Both front and rear springs are of the half-elliptic pattern without central assembly bolt. Rear springs are underslung and are approximately 56 in. long by $3\frac{1}{4}$ in. wide. The front springs are 40 in. long by $2\frac{1}{2}$ in. wide.

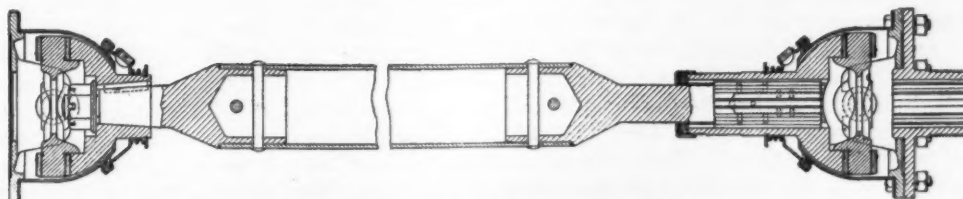
There is nothing unorthodox in the front axle design, which embodies an H-section beam with forked swivel axles having plain journals for the wheels, with bushes and a ball thrust washer for the swivel pin. Ball joints are used for the drag link.

A worm and full worm wheel is also conventional, the only points of note being the adjustable thrust stud for the worm wheel shaft and an eccentric adjustment for the mesh of worm and wheel.

Some major dimensions and ratios follow: Wheelbase (optional), 144 in. and 162 in.; track, 61 in.; dash to rear axle, 126 in. and 144 in.; width of frame, 31 in.; height of frame unladen, 31 in.; final drive ratio, 6.25 or 6.75 to 1; ratios in gearset, first 5, second 2.79, third 1.7, fourth direct, reverse 6.32. Price of chassis in England is £495.



Outer end of rear axle, showing plain bearing with floating bush



Hollow propeller shaft with Spicer joints used on A. E. C. two-ton truck chassis

Accessory Makers Can Reach Export Market at Low Cost

Proper foundation and sound methods are more important than spending large sums of money. Good business can be built by correspondence and advertising.

By P. A. Karl

Export Manager, Brunner Manufacturing Co.

AMERICAN manufacturers of automotive equipment have before them a constantly growing market for their products in foreign countries. Many dollars' worth of goods can be sold to these markets each year by the application of intelligent methods and without any great financial outlay. If a thorough study of information available in this country about various overseas markets preceded actual sales effort, the small equipment manufacturer can build up a permanent and profitable export business without risking any great amount of capital.

Too often lax merchandising methods have followed the filling of initial export orders and financial loss has resulted, not because a need for the product was absent but because intelligent and consistent sales effort was lacking. Proper methods are even more important than the ability to spend large sums of money in developing foreign markets. The small maker of automotive equipment has a real opportunity in the foreign field.

This is demonstrated by the fact that several equipment manufacturers already have developed a world-wide distribution of their products with no sales help other than correspondence and a moderate advertising appropriation. These concerns could make more rapid progress, of course, if they had a group of travelers operating for them in various parts of the world, but their possible sales volume does not justify such expense. Nevertheless, they have built up a capable distributing organization and are keeping up a steady flow of sales through mail and advertising contact.

How did they do it?

Six Fundamentals

Their methods included a few fundamentals which must be present in every successful plan. Among these are:

1. Market analysis of each of the important foreign fields designed to show the possible market for the products, the competition already in the field, the proportion of total business the particular firm reasonably can expect to procure within a few years and the logical location for distributing points.

2. An export manager capable of clear thinking, possessed of knowledge of foreign markets, able to understand the point of view of customers whose life and background differ materially from his own and capable of directing important sales work.

3. Sufficient authority and opportunity for the chosen export manager to enable him to perform efficiently the duties of his position. The general manager should not be impatient nor grudge the time necessary to develop permanent business relations which will form the basis of a continuous and growing trade.

4. Lists of distributing organizations likely to be interested in and capable of handling the product. Such lists will form the basis for the direct mail effort to get distribution. They can be obtained from the Automobile Division of the Bureau of Foreign and Domestic Commerce and can be augmented from other sources.

5. Constant contact with other exporters in similar lines and with organizations and publications directly associated with the field.

6. Consistent and intelligent letter writing, backed up by consistent advertising reaching the men who are possible prospective distributors for the product.

Building Up Distribution

The manufacturer must have in each worth while automotive market distributors who carry an adequate stock, who know the line and who will push its sale. Such distributors will absorb each year a given amount of merchandise, with increases from year to year as markets expand and the line finds greater general usefulness. There may be off seasons due to local conditions, but on the whole export business can be anticipated fairly well.

A rigid, inflexible sales policy will not build up world-wide distribution. Each market requires special attention and plans must be shaped with full regard for the interests of foreign dealers. In many cases it is necessary to grant sixty to ninety days' credit, to issue literature in the customer's language and to offer special inducements which might not be necessary in domestic trade.

The initial order should be the starting point for continuous, intelligent and helpful sales assistance. The overseas distributor needs stimulation equally as much as the domestic merchant. Therefore, the manufacturer must keep in constant contact with him, offering new sales thoughts and new ideas about the product.

On the other hand, the manufacturer should endeavor at all times to learn from his foreign distributors what problems are being met, what special local conditions exist and what sales resistance is being encountered. By securing an intelligent and sympathetic understanding with distributors the manufacturer will be able to offer more valuable assistance which will result in greater distribution and profit.

The equipment manufacturer who desires to open a permanent export outlet for his product should determine first where his product can be sold, what demand now exists and what potential demand can be developed. Preliminary information on these and other vital points, including extent and degree of local competition, can be secured from the Automotive Division of the Department of Commerce and from trade publications, where the

manufacturer will find executives trained automotively who are ready and eager to assist in the formation of an export plan. Those who have not been in Washington to consult the Government automotive overseas trade files do not realize the vast treasury of facts that has been built for the use of American automotive exporters. Aid from this source can be had for the asking and should be used before steps are taken to form an export department.

Valuable advice and information often can be obtained from the trade associations and from equipment manufacturers already active in overseas trade.

Selecting an Export Manager

When export effort has been decided upon, an export manager should be selected to promote sales and to direct organized export routine. This position can be filled by someone within the organization, if adapted to the work, or by someone chosen from outside. Both plans are used and have been successful in proportion to the wisdom exercised in the selective process.

The necessity for sales direction by an individual who is conversant with conditions overseas, who knows what methods will get export distribution and who can apply successfully his knowledge in the development of the export department is obvious. Unless a single person is placed in charge and held responsible for results, success cannot be attained. Expense may be saved in the beginning, however, by dividing the work of the export manager so that his duties will embrace several lines of endeavor. He might spend half his time in promoting export sales and the other half on domestic work, thereby permitting one-half of his salary to be assumed by domestic sales expense. Such a plan has proved workable and successful.

When the right person has been chosen to organize and direct the promotion of export sales, he should be given every opportunity to develop the business along sound lines. Continuous and growing overseas trade is accompanied by more or less slow growth. The results achieved by a sound policy are well worth while, although the first and sometimes the second year's business are small in volume. A policy of quick returns may mean loss of future business.

Patience Is Needed

When an export business is developed exclusively by correspondence and advertising, it is obvious that a wide margin of time should be allowed. A letter cannot be answered in a week even from nearby territories such as Cuba, Mexico and West Indies. Many important markets are located on the opposite side of the world and replies from these markets cannot be obtained for three months or more in many cases.

A letter sent to a list of overseas importers cannot be expected to result in a flood of orders. The foreign agent has to be sold on the product, its profit-making possibilities and on the house manufacturing it before he parts with his money.

So the letters may go forward. Now and then a reply will come in which results in isolated connections. These early returns, though meager, should give stimulus to continued energy and effort in winning export trade. In time greater returns will result from the effort expended, if the plan has been shaped correctly and ably carried out.

Even foreign importers who fail to answer twelve or fifteen letters may come to life, ask for further details and become worth while, permanent distributors. Such agents are not sold readily but, once sold, will pay well. This type of firm continues its connection and remains loyal in spite of heroic efforts by competitors to land the account.

Some manufacturers have hesitated to embrace this

policy of sound, slow, steady export growth because of the expense involved. The cost of getting business may seem to be greater than the volume actually received. That will not be so unless the manufacturer spends his money unwisely and without regard for adequate return. A well planned campaign for export business will yield some immediate results, sufficient in most cases to keep the export department from running very heavily into red figures. Some loss should be expected, however, during the first year or two, but no more, if as much, as the loss taken in the development of any new domestic territory.

When comparing the cost of getting foreign and domestic business, one should bear in mind that foreign business, developed and carried on by mail, does not bear the high traveling expenses which must be levied against domestic business. The cost of obtaining export distribution depends altogether on the effectiveness of the foreign policy, the ability of the export manager and the care with which money is expended. There are so many "ifs" and "ands" involved that one cannot hazard a definite statement of the percentage of cost for selling in any given line; such cost is relative.

Outside Sales Agents

The program outlined here will not meet the needs of every automotive equipment manufacturer. Some may find their requirements better served if development and conduct of export business is turned over to an individual or company which acts as export department for a group of allied but non-competing manufacturers. This has been done quite often with success. What the outside export department may lack in knowledge of the products may be balanced by expert knowledge of foreign conditions and acquaintance with buyers overseas. To get results the outside export department must have able executive direction, knowledge of foreign markets and conditions and friendly or intimate relations with overseas importers who can handle the line. There are a number of outside export departments worthy of consideration and others that are not.

Leaving out of consideration those who turn over their export business to an outsider and those whose volume justifies the expense of overseas traveling, there are a great number of automotive equipment manufacturers who could develop a permanent and stable outlet of growing importance for their products in foreign countries. Well planned and sustained effort for export distribution will give American automotive products greater prestige overseas and will pay the exporting manufacturer good dividends.

These dividends become particularly desirable in times of domestic stress. Export business, properly cultivated, is an insurance that the factory will be kept busy when the buyers at home cannot or will not buy.

IN a discussion at a meeting of the Gage Steel Committee of the Bureau of Standards it was brought out that the ordinary hardness tests, such for example, as the scleroscope, Brinell and Rockwell, mean very little as regards resistance to wear. Results so far obtained by means of the Amsler wear test machine also appear to be of little value when applied to gage steels. For example, the Amsler tests appear to show that chilled iron and stellite wear much faster than ordinary hardened gage steel, whereas it is known that in actual service these materials wear much less rapidly than do ordinary gage steels. Resistance to wear in gaging probably could be best determined by a lapping machine in which three specimens were lapped simultaneously, under standard conditions, and the rate of wear directly compared.

How Internal Losses in Power Plants Vary with Speed

Determined by "motoring" engine with an electric dynamometer. Torque representing pumping loss is directly proportional to r.p.m. but frictional loss is independent of that factor. No material difference in friction whether idling or under load.

By P. M. Heldt

IN steam engine practice, if the internal losses of the engine are to be determined, it is customary first to take an indicator card, from which the indicated horsepower is obtained by planimetry; then to measure the power delivered at the shaft by means of a Prony brake or other absorption dynamometer, and then to take the difference between the indicated and the brake horsepower. The same method could be applied to the internal combustion engine, but the high speed indicator is seldom used for horsepower determinations, as not much reliance can be placed upon it as regards accuracy. The method in general is also open to the objection that measurements have to be made of quantities much larger than that which is to be determined, and any error in the actual measurements therefore may be greatly magnified in the value sought.

These two reasons—lack of accuracy of high speed indicators and multiplication of the errors of observation—have induced engineers to measure the internal losses of gasoline engines directly. Such measurements cannot be made while the engine is under load, but it can be shown that there is no material difference in the internal losses whether the engine is idling or carrying a load. Those who still think of bearing friction as affected by the simple laws of dry friction must rid themselves of the notion. Oft-repeated experiments have shown that the friction coefficient in the case of well lubricated bearings is practically inversely proportional to the load and that the total friction therefore is independent of the load. But even if the total friction varied with the load the results of a friction horsepower test as ordinarily run still would be substantially correct, because the average bearing load is far more dependent upon the inertia and centrifugal forces—which are the same whether the engine is idling or carrying a load—than upon the load.

Two Sources of Bearing Load

When the engine is idling the pressure between the piston and the cylinder wall is due solely to the inertia of the reciprocating parts, while the pressures between the various journals and their bearings depend upon both the inertia forces of the reciprocating and the centrifugal forces of the rotating parts. These pressures or loads are present throughout the four strokes of the cycle, instead of only during the power stroke (and to a lesser extent during the compression stroke) as are those due to gaseous pressure.

Moreover, the bearing loads due to gas pressures and to mechanical forces respectively do not add together directly. For instance, at the beginning of the power stroke the inertia forces are in the opposite direction to the gas pressure, and the two therefore tend to cancel each other,

whereas during the latter part of the power stroke the two forces are in the same direction and therefore add together. Thus, since the inertia forces are present at all times, the bearing loads due to gas pressure may be regarded as separate and as sometimes adding to and at other times during the cycle detracting from the bearing loads due to inertia and centrifugal forces.

Considering that gas pressures are active in the cylinder during only two of the four strokes of the cycle and that these pressures soon increase and soon decrease the bearing loads due to mechanical forces, and considering further that the friction does not vary to any great extent with the load on the bearing, it is obvious that the power required to turn the engine over at any given speed represents very closely the power loss within the engine when the latter is carrying a load at the same speed.

Friction Loss Determined by "Motoring" Engine

A friction horsepower curve is obtained by "motoring" the engine by means of an electric dynamometer, the torque on the field frame of the dynamometer then indicating the friction torque. The test can be made in a number of different ways. Ordinarily the engine is completely assembled and is "motored" with the throttle wide open.

The torque measured under these conditions represents both the various mechanical friction losses and the so-called pumping losses. By pumping losses is meant the losses occasioned by gas pressure on the piston contrary to its direction of motion.

During the greater part of the inlet stroke the pressure in the cylinder is below atmospheric, hence the air pressure against the piston on the crankcase side is greater than that on the combustion chamber side, and the difference in pressure on opposite sides of the piston tends to make it rise, whereas in reality it descends. A pull must be exerted, therefore, on the piston by the connecting rod to overcome this difference in air pressure on its two sides, and this involves a loss of power.

During the compression stroke power must evidently be applied to the piston in order to overcome the pressure of the partly compressed charge on its upper side. During the following stroke, the expansion stroke, piston motion and air pressure are for the first time in the same direction and for this reason power is applied by the gases to the piston. If there were no loss of heat through the walls of the combustion chamber, and no leakage of charge through the valves, past the pistons, etc., then exactly the same amount of energy as that consumed in compressing the charge would be returned during the expansion stroke, but these conditions do not hold true and there is therefore a certain energy loss also during the compression and

expansion strokes aside from mechanical friction. During the exhaust stroke, except at the very beginning, the pressure in the cylinder is slightly above atmospheric and is therefore opposed to the motion of the piston, which causes a further loss.

In order to eliminate the pumping losses in friction horsepower determinations it is customary to remove the valves and valve plugs (if the latter are used) as well as the spark plugs. Atmospheric air can then follow the motions of the pistons without appreciable resistance and practically all pumping losses are eliminated, leaving only the losses due to mechanical friction.

Items Included in Idling Loss

These friction losses are made up of a number of items. There is first the friction of the rings against the cylinder walls, which can be ascertained by removing the rings from the pistons and noting the difference in the torque required to "motor" the engine. The pressure of the rings against the cylinder wall is independent of the speed, but the same does not hold true of the pressure of the piston against that wall. This latter pressure, when the engine is being "motored," is due entirely to the inertia of the reciprocating parts, which increases as the square of the speed.

For any particular crank position and for any given design of engine the pressure of the piston against the cylinder wall is a constant proportion of the inertia force due to the reciprocating parts, and it follows that the pressure of the piston on the cylinder wall varies as the square of the engine speed.

The same thing applies to the loads on all of the bearings. The load on the piston pin bearing is dependent only upon the inertia force, while the loads on the crank-pin and crankshaft main bearings depend upon the inertia forces due to the reciprocating masses and the centrifugal forces due to the rotating masses, and the latter forces also vary as the square of the speed.

Relation of Bearing Load to Speed

From the above it will be seen that part of the bearing load (the pressure between bearing surfaces) is independent of the speed, while another part varies as the square of the speed. The friction torque, of course, depends upon the frictional force, which is related to the bearing load through the friction coefficient. The friction coefficient varies with the speed, increasing with it quite perceptibly at low speeds, and it would therefore be expected that the friction torque increased with the speed.

The writer has analyzed a number of friction horsepower curves and finds that the friction torque may be resolved into one component that is constant or independent of the speed and another that varies directly as the speed. In the analysis a component varying as the square of the speed was also looked for, but it was found that this soon had a positive and soon a negative coefficient, which in most cases was exceedingly small, so that the conclusion seemed justified that this component was due to errors of observation or changes in operating conditions besides those noted.

Test results show that the torque corresponding to the pumping losses varies substantially as the first power of the speed. A very extensive series of tests was made on a Pierce-Arrow six-cylinder engine by Herbert Chase in 1912, and the results were given in an S. A. E. paper of that year. The engine was "motored" both completely assembled and with the throttle wide open, and with all of the valves and plugs removed from the cylinders. There was a material difference between the torques required to turn over the engine under these two conditions, and this represents the torque due to the pumping losses. This dif-

ference in torque amounted to 8.4 lb.-ft. at 470 r.p.m., 16.4 lb.-ft. at 1000 r.p.m., and 29.5 lb.-ft. at 1700 r.p.m. It will be seen from these figures that the pumping loss torque is very closely proportional to the speed.

These results are confirmed by other data, such as the test results obtained by Dr. Watson, who took indicator diagrams from the inlet manifold of a four-cylinder engine at different speeds. At 656 r.p.m. the average vacuum in the inlet manifold was slightly more than one-half as great as at 1200 r.p.m. From this it would appear that the flow of the charge through the carbureter is largely a streamline flow, because if it was an eddying flow the pressure required to force the charge through would vary as the square of the speed.

The part of the internal loss torque which one would expect to remain most nearly constant through speed changes is that due to the piston ring friction against the cylinder wall, because the pressure of the rings against the cylinder is not affected by engine speed. On the whole the theory of lubricated friction would lead one to suppose that the torque representing loss due to mechanical friction would increase somewhat with the engine speed.

Measuring Torque Loss

In Dr. Riedler's book on "The Scientific Determination of the Merits of Automobiles" are given friction horsepower curves for a number of engines, including a four-cylinder 3.38 by 5.52-in. Adler and a four-cylinder 3.94 by 5.12-in. Mercedes Knight. The torque loss due to internal friction and pumping of the former engine can be expressed by the formula

$$L = 4.84 + \frac{V}{232} - \frac{V^2}{3,210,000} \text{ lb.-ft.}$$

while that of the Mercedes Knight engine can be represented by the equation

$$L = 3.47 + \frac{V}{566} + \frac{V^2}{7,880,000} \text{ lb.-ft.}$$

The low internal loss and consequent high mechanical efficiency of the Knight type engine is rather remarkable. From a *priori* reasoning one might expect considerably greater friction loss in the Knight than in the poppet valve engine, for in the former we have not only the motion of the piston but also the motions of the two sleeves causing friction. But it must be taken into account in this connection that all of these motions are not cumulative, as it were, for a good deal of the time adjacent parts are moving in the same direction but at different speeds, and the total relative motion therefore is not increased as much as would appear at first sight.

Sliding Motion in Sleeve Valve Engine

This total relative motion can, of course, be readily determined by measuring the individual relative motions of the outer sleeve relative to the cylinder wall (which is equal to the stroke of the sleeve); of the inner sleeve relative to the outer one and of the piston relative to the inner sleeve, and adding the three items together. But what may be the chief factor in reducing the friction loss in a Knight motor is the fact that the oil films between the different metallic surfaces are maintained at a comparatively high temperature, consequently the viscosity of the oil is low, and this in turn reduces the friction.

In the above equations for the friction torque the term proportional to the square of the speed is quite small even at maximum speed and, moreover, is positive in one case and negative in the other. It may therefore be neglected and the friction torque considered made up of one item independent of the speed and another directly proportional to the speed.

A friction horsepower test of a Ford engine (four-cylinder $3\frac{3}{4}$ by 4 in.) was made at the Bureau of Standards, and the results can be expressed by the equation

$$L = 6.18 + \frac{V}{57} - \frac{V^2}{218,000} \text{ lb.-ft.}$$

At a recent S. A. E. meeting Henry M. Crane gave friction horsepower data for a six-cylinder $4\frac{1}{4}$ by 5-in. engine, and the friction torque for this engine can be represented by the equation

$$L = 17.9 + \frac{V}{25.8} - \frac{V^2}{800,000}$$

The internal losses of the six-cylinder $4\frac{1}{2}$ by $5\frac{1}{2}$ -in. engine tested by Herbert Chase may be expressed by the equation

$$L = 12.3 + \frac{V}{43.8} - \frac{V^2}{222,000}$$

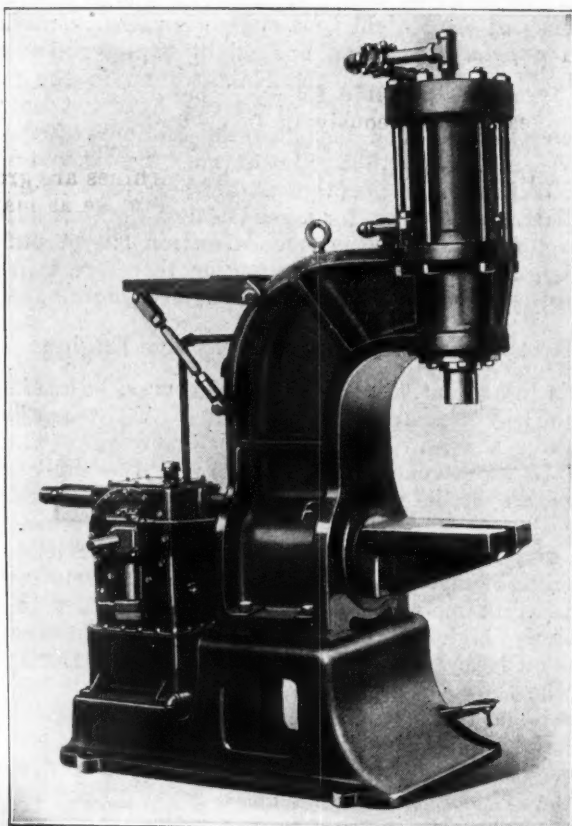
The thought occurs that one might transform these

various equations for the internal loss to a basis of a piston displacement of say 100 cu. in. and then take an average of the values of the three constants, to obtain an equation for the internal loss torque to be expected in an average engine. A little reflection, however, shows that such an equation would be of little practical value.

Considering two engines of the same cylinder dimensions, one designed for a peak load speed of 1500 and the other of 3000 r.p.m., the pumping loss at 1500 r.p.m. will naturally be much greater in the former than in the latter. Similarly the friction loss depends very largely upon the bearing area and the bearing diameters, and these may vary within considerable limits for engines of the same piston displacement. An attempt to derive such an equation from the data given leads to the result that the V^2 term practically vanishes, and the conclusion therefore seems justified that the so-called idling torque consists of one item independent of and another directly proportional to the speed.

Oilgear Company Develops New Hydraulic Riveter

EITHER belt or motor drive at constant speed may be used for the operation of the new hydraulic riveter of the Oilgear Company of Milwaukee, which sets rivets by dead pressure or by a single stroke. This unit is self-contained, as are the presses and broaching machines made by the firm, and may be moved to any part of the shop wherever there is a source of power at constant speed available. The pressure-producing element of the riveter is a variable delivery pump which is slightly modified for this particular purpose and is designated as the Type W-E Oilgear constant pressure pump.



New Oilgear hydraulic riveter

As described and illustrated in AUTOMOTIVE INDUSTRIES of Aug. 16, 1923, this pump possesses the feature of quickly producing any pressure within its capacity that may be required to overcome the resistance offered. The delivery is free from pulsations and is instantly variable from zero to the maximum. In this particular machine the pump is controlled by a treadle, which allows the operator the use of both hands for supporting and handling the work. Combined with the responsiveness of the pump, this feature results in considerably increasing the speed of riveting operations.

As shown by the accompanying illustration, a hydraulic cylinder with a piston having a 4-in. maximum stroke is supported at the head of an H-section column. This column in turn is bolted to a base which also carries the pump at the rear. The pump unit has a shaft extension at the left side for a belt pulley or motor coupling. A treadle shown at the lower right controls the action of the pump. As illustrated, the machine is equipped with work table or horn for the accommodation of an indexing fixture, but this detail can be varied to suit the requirements of the individual job. In the standard sizes the capacity of these machines ranges from 10 to 20 tons.

As the maximum stroke of the ram is 4 in., the work table can be adjusted so that the ram in the refracted position just clears the ends of the rivet when new work is put in place. Upon application of the treadle, the ram descends until the rivet is squeezed into its finished form. It is claimed that setting rivets by this hydraulic method, subjecting each rivet, whether hot or cold, to a quick squeeze, is superior in that it allows the metal to assume its new shape and make a tight joint without unduly stressing it.

WASHING machines are coming into extensive use in machine shops for cleaning parts of grease and dirt, both after being completely machined and therefore ready for the assembling department, and between certain operations. In place of the familiar soda kettles which were decidedly bothersome, and the dangerous gasoline tanks, use is now made of steam washers operating on the continuous principle, the dirty parts entering at one end and cleaned ones coming out at the other.

Unusual Tool Grouping Lowers Costs of Nash Engine Production

Extra operations resulting in superior finish are made possible on this account. Many special machines are employed. Cylinders are bored three times, reamed once and honed. 600 blocks can be completed without renewing stones, which cost only \$1.68 per set.

IN the Nash four-cylinder car plant at Milwaukee an effort is made to utilize the best possible finishing operations without undue production expense. Complete jiggling and tooling plus the grouping of tools so that more than one machine can be handled by a single operator, even if the tools so grouped are not performing consecutive operations, are material factors in accomplishing this result. For instance, there are five operations on the cylinder bore to produce the desired grade of finish, in spite of the fact that the Nash four is a moderately priced car. The first three are boring operations, the fourth is a finish ream and the fifth, which is done after all the other work on the block is finished, is a honing operation performed by a special machine driven by an electric motor.

It would be impracticable, on a car in this price class, to go to this length in bore finishing were not the machines all along the line designed to finish the block at a low cost. The honing operation alone has been discarded by some companies manufacturing higher priced cars because of the expense. Most of the trouble, however, has been due to the fact that it has been costly to keep the hones in proper condition to hold the desired diameter accurately.

Simplified Hone Used

A simplified hone, designed at the Nash plant, is employed. This hone maintains a correct diameter for a long time, but can be restoned at negligible expense. On a large run of cylinder blocks through the plant, a production of 550 to 600 blocks per set of stones has been obtained and the stones are renewable at a cost of \$1.68 per set. The operation of honing is described later.

Whenever possible machines for manufacturing the block have been so arranged that one operator can

handle simultaneously two or more operations. On the other hand, where sufficient gains in speed are made by putting two operators on one machine, this also is done.

Very often the operations supervised by the same workman are not consecutive but skip several which cannot be handled in pairs or threes. For instance, the same operator handles operations 7 and 9 which are, respectively, rough boring the cylinders and chamfering the bottom of the bores. Operations No. 12 and 14, line reaming the camshaft bearing bores and finish reaming the cylinders, also are run simultaneously. No. 13, the intermediate operation, finishing the distributor hole, is handled by a separate operator.

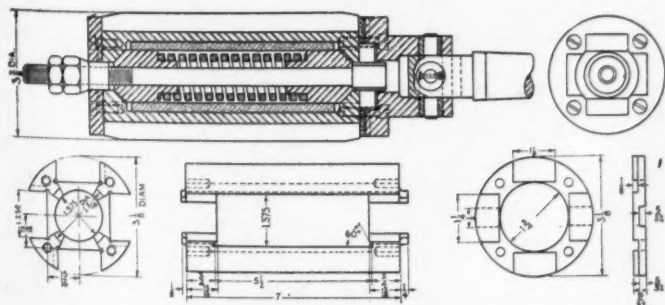
Two Men on Some Operations

In such jobs as that of tapping all the holes in the top flange and tapping the oil pump screw hole, two men are required. The same is true of the tapping of all the holes in the bottom flange. A third operation which requires a machinist and helper is that of drilling for the oil pump screw hole and other holes handled on the same machine. This requires a helper for the reason that the block has to be handled manually.

Where it is possible for one operator to handle two machines simultaneously in full production, sometimes he can operate three or even four on modified or low production. With this in mind, the machines are grouped along the entire manufacturing line to make as many as possible accessible to one operator, instead of being placed in a long line where it would be difficult for one worker to take care of two or more machines.

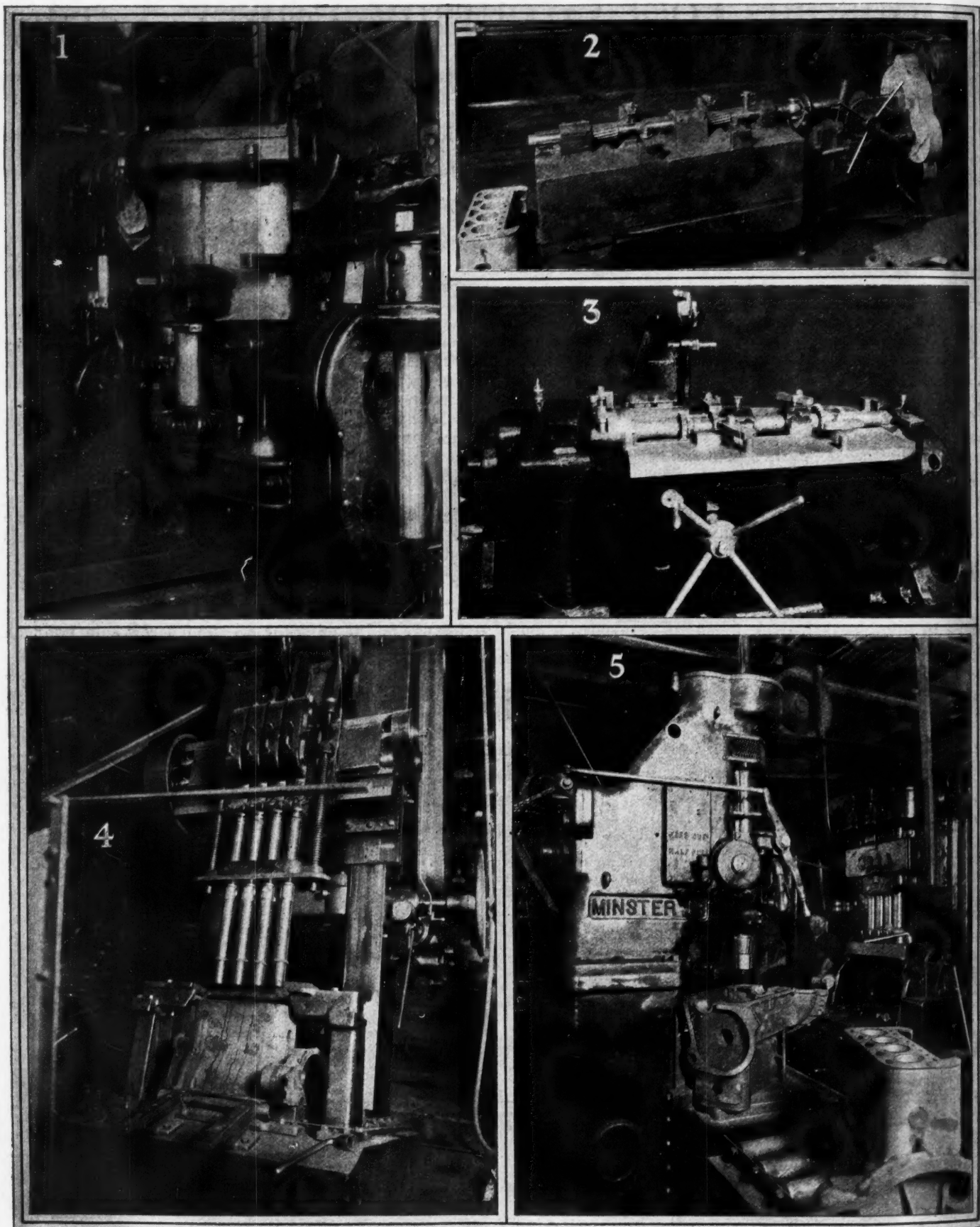
Since the sequence of operations differs from those used in many four-cylinder plants, a review of them is of interest. The cylinder blocks are kept four months for seasoning. The first work on the block is to establish initial locating points. In this operation, four Welch core plug holes are drilled on a 24-in. Cincinnati drill press. Two of these are in the left wall and are used for locating points. The blocks are sprayed with duPont crankcase sealer, dried in a Young Brothers electric oven and passed along to the initial milling operations which are performed on Ingersoll machines. The first operation handles three sides of the block, rough and finish milling the main bearings, cylinder head flange, and bottom flange and side. There are four rough and four finish cutters, all Stellite.

Location for the milling is from two dowels against the end of the cylinder block and against the outside of the cylinder wall. Thus the distance from the cylinder center line to the outside of the wall is fixed. The half main bearings are reamed on a special machine with an unusual locating arrangement designed in the



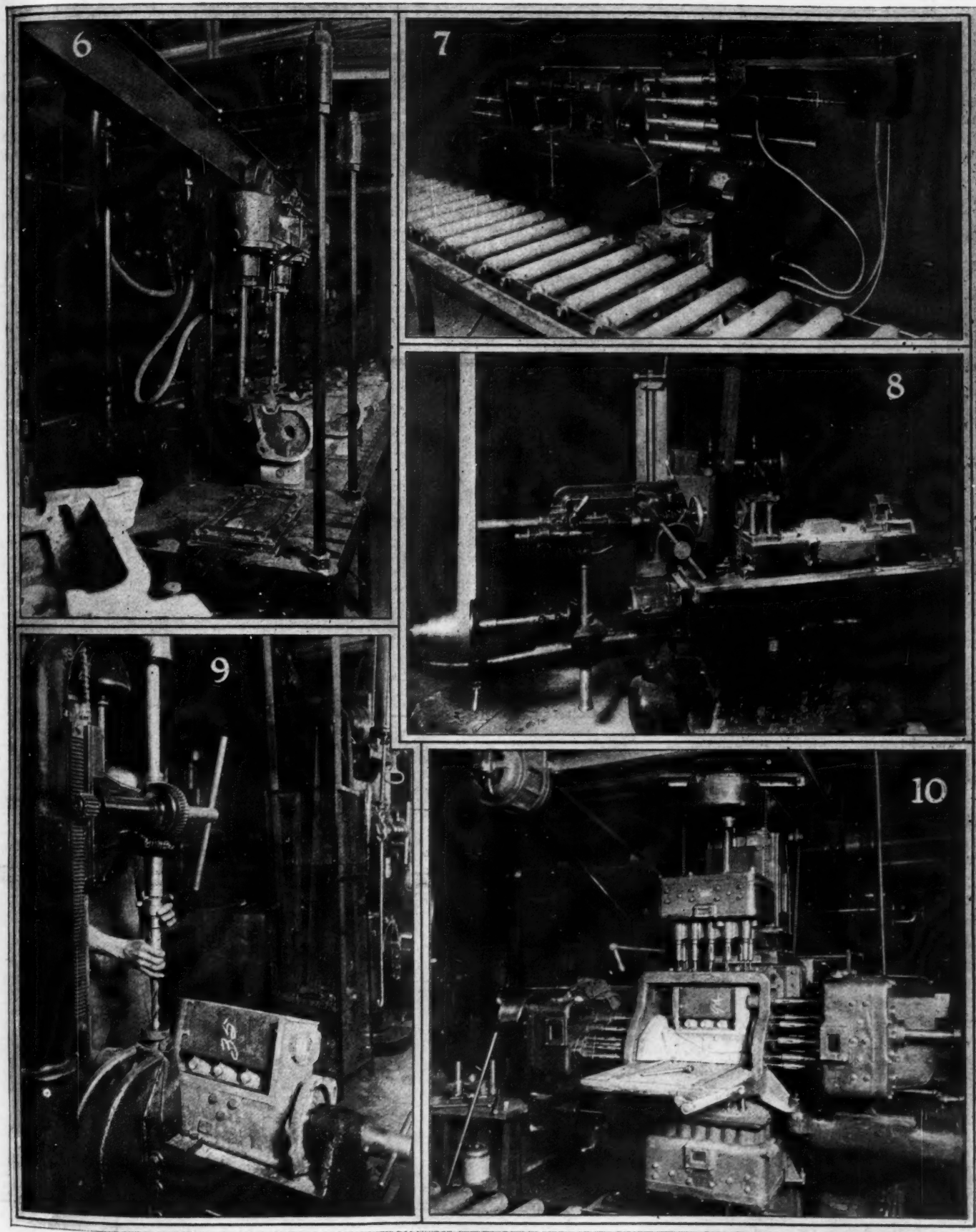
Sectional view of honing tool developed by the Nash company, which exerts equalized spring pressure against the block, and provides a low upkeep expense on this tool. As many as six hundred blocks have been honed with one set of stones the replacement of which costs only \$1.68

Special Methods and Equipment Used in Pro



1—Mill top and valve side. Rough and finish mill bottom. Rough and finish mill half holes for main bearings. Ingersoll miller. 2—Ream bearing holes to size, special machine. 3—Mill bearings to length, etc. Special milling machine. 4—Semi-finish bore cylinder, Moline cylinder boring machine. Boring bars piloted top and bottom. Same type of machine used for finish boring cylinder. 5—Chamfer bottom of cylinder bores, Minster, Jr., drill

Production of the Nash Cylinder Block



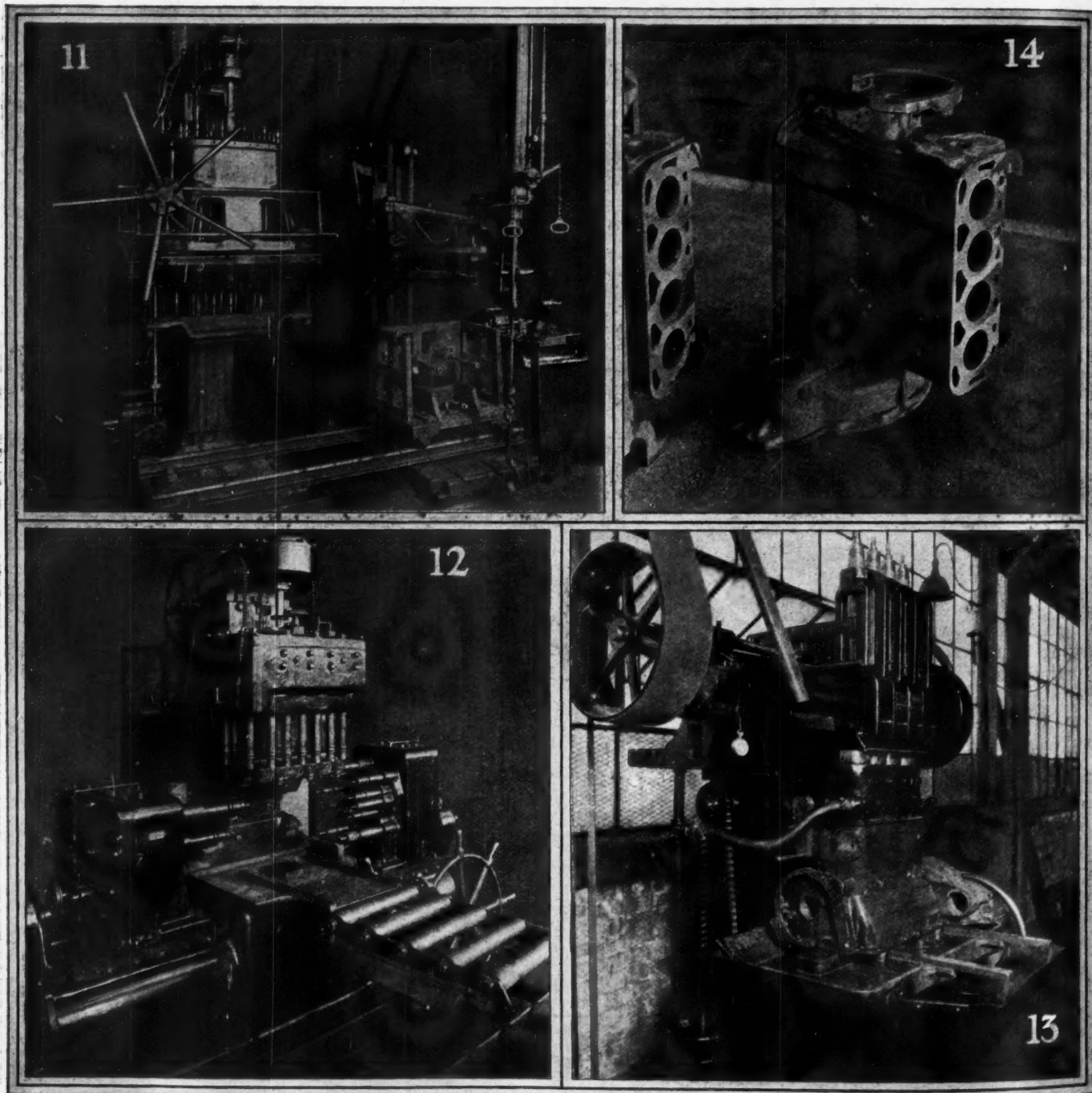
6—First water test, special equipment. Similar equipment used for water test after all machining operations are finished. 7—Bore and ream camshaft bearing and starter holes. Special machine equipped with Oilgear feed. 8—Line ream camshaft bearing holes, Barnes horizontal drill. 9—Drill, ream, face, etc., distributor bracket hole. Thirty-inch Snyder sliding head drill press. 10—Drill holes in top, bottom, front and rear. Special Foote-Burt four-way drill

Nash factory. Location for this work is from the rough half bearings over rocking location plungers operated from an air chamber. The block is located against the plungers and clamped down against the air pressure. The plungers then recede, allowing clearance for the reamer. By this method of location, the half main bearing holes are aligned and can be used for locating other operations. In fact, most of the operations are located from the main bearing after this operation is completed.

A straddle milling operation on the main bearings and oil throw clearance follows. This operation is located sideways from the reamed half bearings and endwise against the front cylinder bore. The front and rear flanges, that is, the timing gear cover face and the bell housing face, and generator pad next are milled on an

Ingersoll machine. The same two men who operate the straddle machine operate the Ingersoll milling machine on the previous operation. These same men also handle a Peerless shell core reamer which core drills the camshaft hole, this being the next operation.

The first cylinder bore operation is performed on a Foote-Burt boring machine, the location being from the front and rear main bearings with the piece held in a box jig. About 9/64 in. stock is removed in this operation, bringing the bore to 3 9/32 in. The cored hole is 3 in. The second boring operation is performed on a Moline inverted cylinder boring machine with boring bars piloted top and bottom. This is a fly-cutting operation. This machine is inclined so that the chips fall away from the lower pilot bushing. After this opera-



11—Drill all holes in right hand side. No. 14 Natco multiple drill. Counterbore two holes and spot face three holes and tap four tappet guide bracket holes and one oil pipe hole in right hand side of case. Hammond radial drill. 12—Tap all holes in both ends of case and sixteen oil pan holes in bottom of case. Foote-Burt tapping machine. 13—Hone cylinder bores. Machine built by Moline Tool Works. 14—Nash four-cylinder block

tion the cylinder bore is 3.345 in. in diameter. Finish boring is performed on the same type of machine with a double cutter following the fly-cut. The final bore is to 3.365 in. in diameter.

The first water test is given the block at this point to check any defective blocks before they go through more expensive operations. The water test machine is a home-made affair equipped with an air lift which lowers the block on to a rubber pad and presses the block against it, sealing the head flange against water leak. Welch plugs are fitted and water pressure is put on the block in the usual manner.

Following the water test, the camshaft bearing and starter holes are bored and reamed on a special double end machine with oil gear feed. The boring bar in this machine is piloted front and rear and a floating drive is employed. The first cut is a fly-cut, followed by a reamer. The oil gear feed provides a variable speed. The crankshaft bearings are finally line reamed on a standard Barnes horizontal drill. This is also a floating drive through a Magic chuck, the boring bar being piloted at the front, rear and center. The distributor bracket hole is bored, reamed and faced, the location for this work being from the front main bearing and the camshaft bearing holes.

Following the operations on the distributor bracket hole, the cylinder bores are given a finish ream to 3.375 in. diameter. This involves the removal of 0.005 in. of stock. The work is done with Wetmore and National Cleveland floating reamers and the work is held within plus or minus .00025 in. limit, taper and out-of-round. The tool used is the Foote-Burt cylinder boring machine.

Various drilling operations on the block follow the reaming of the bore. Both ends and the top and bottom are drilled simultaneously on a Foote-Burt four-way drill with a box jig. The holes on the valve side are

drilled on a No. 14 Natco rail type of jig and this is followed by tapping operations with a Hammond radial tapper.

Twenty-seven top and side holes are tapped simultaneously on a Foote-Burt machine and, on the following operation, thirty-nine additional holes are tapped on the bottom and two ends. Another Hammond radial takes care of all the holes not drilled or tapped on the multiple machine. Following the drilling and tapping, the final honing of the cylinder bores takes place.

Hone Design Is Novel

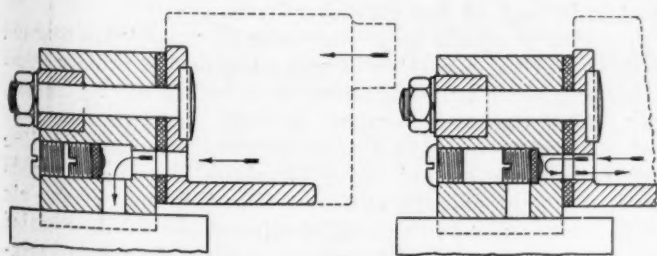
Nash officials state that much of the success of the honing operation on the bore of the four-cylinder car is due to the design of the hone itself and the speed at which it is operated. The hone is a four-way tool, the four stones being spring expanded so that they bear against the cylinder wall simultaneously and with equal pressure. Nash four-cylinder crankshaft and connecting rods were utilized for transforming the rotary electric motor drive into a reciprocating motion necessary for the honing stone.

Hones are given 33 strokes per min. and also rotate at a speed of 71 r.p.m. The honing stones are of crystalline, Norton 180 M, and take off about .0005 in. on a side, or a total of .001 in. on the bore. The reamed bore is the starting point for the finish, the stone merely taking off the irregularities left by the reaming. The sectional view of the honing stone holder shows the mounting of the stone and the method of equalizing the spring pressure against the bores.

After honing, the blocks are washed in a Blakeslee washer and given a final water test in a machine similar to that on which the first water test was made. They then receive an inspection and are passed along to the assembly department.

New German Radiator Has Sectional Core

THE German Spinn radiator, of which a detail view is shown herewith, is claimed to possess the special feature that every tube may be disconnected from the circulating system and taken off the radiator without dismounting the latter, while the outside appearance of the radiator is not affected. Each section of the radiator core has a special head-piece which is clamped by means of



Showing headpiece of Spinn demountable radiator section

the cap screw and the yoke against the angle iron cross bar, a packing plate being inserted between the head pieces and the angle iron. When the section of the core is thus clamped in position, a horizontal drill hole in it registers with a corresponding drill hole in the angle iron which forms part of the top tank. A similar connection is used at the lower end of the section.

The outer portion of the horizontal drill hole in the head piece is counterbored and threaded to receive a

threaded plug and a machine screw, the former serving to close the passage through the head piece and the latter to close up the outer end of the opening. The screw plug is provided with a washer of non-metallic material at its inner end, which will form a watertight joint. Ordinarily this screw plug is screwed into the head piece only far enough to allow the machine screw to seat, but if the section becomes defective the plug is screwed down on its seat, thus shutting off the section. An advantage of the Spinn over other sectional radiators is claimed to be that in the former only the defective tube needs to be shut off, instead of a section comprising from six to eight tubes.

CONSIDERABLE attention has been paid in England to what is known as the Burney scheme for imperial transport by lighter-than-air craft. Some details of the scheme were given in a recent issue of the *Manchester Guardian* by Major Robertson. The plans for airships are well advanced and the ships are said to differ greatly from all those constructed in the past. In war-time airships, a factor of safety of 1.5 was sometimes adopted, but the Burney shops, it is stated, will be constructed with a factor of safety of 4. The propelling power will be derived from seven engines, each of 600 hp., and a ship speed of 80 m.p.h. is anticipated. Contrary to previous general practice, the fuel used will be kerosene and hydrogen. The use of the latter gas will enable a considerable saving to be effected, since under general running conditions large quantities of gas are blown off to waste.

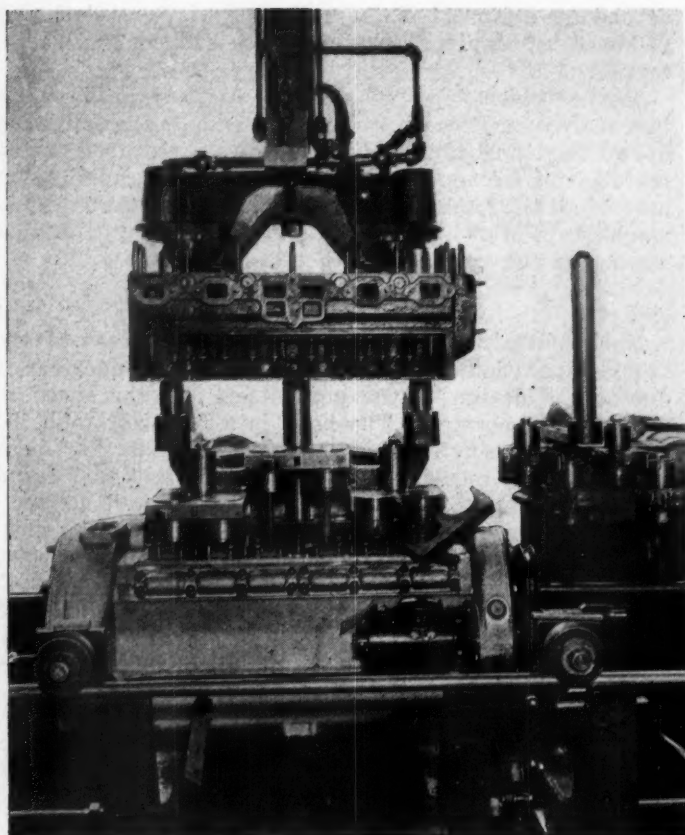


Fig. 1—Carrying yoke in topmost position showing upper ends of the pilot arbors just below pilot bushings. Note how clamps square up pistons and rings

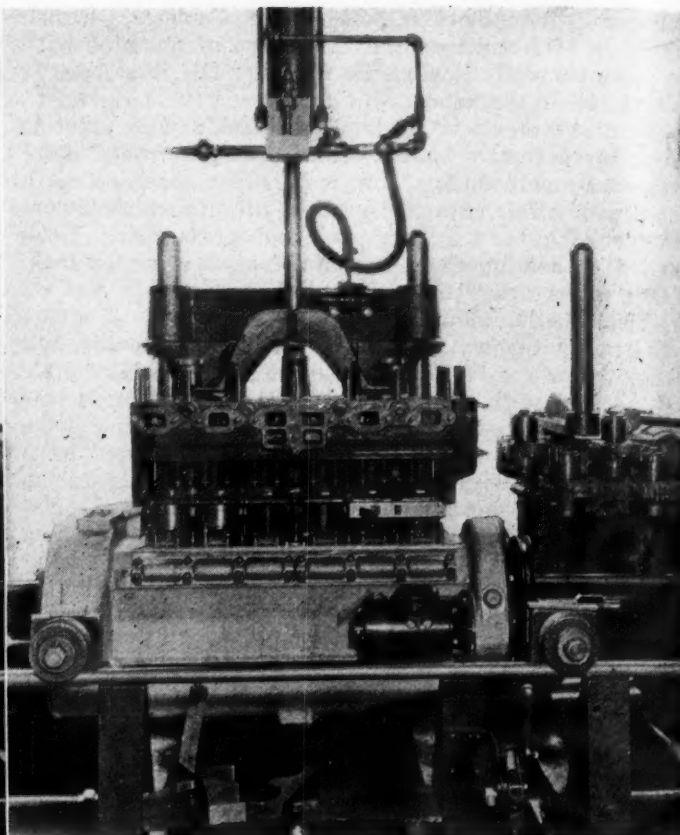


Fig. 2—Two caps have been removed, rings have all entered cylinders but block is still supported by cross slide

Special Fixture Used in Assembling Packard Cylinder Block to Crankcase

Preserves alignment standards of connecting rods, pistons, and rings previously installed. Device is operated pneumatically and, by simplifying work, makes possible more rapid production.

TO preserve the intended engineering standards in respect to connecting rods, pistons and rings before the installation of the cylinder block, the Packard Motor Car Co. has adopted a pneumatically operated fixture for the assembly of the block to the crankcase. Attention which is given to ring fits in the grooves and the clearance in the cylinder barrel, as well as rod and piston alignment, can be nullified when the cylinder block is installed in the ordinary way by rocking it down over the pistons. This possibility becomes greater when the cylinder block is rather long, as in the cases of six or eight in line engines.

To eliminate difficulties from this source, a fixture was designed which first clamps the rings into their normal position and then causes the cylinder to travel straight down in the normal square relationship to all parts. This fixture also has enabled operators at this station to perform their work much more rapidly than operators at other stations in the engine assembly line. An arduous job which was attended by considerable possibility of internal damage has been replaced by a very simple operation which is based upon fixed condi-

tions, leaves little to chance and requires much less skill and judgment of the assembly hand.

In spite of efforts to produce straight and truly aligned rods of normal structure it was ascertained that in some instances more or less distortion occurred during assembly. The Packard company now is straightening rods by a coining operation following forging and is line boring the upper and lower bearings of the eight rods with diamond pointed cutters. The bearings of the six rods are broached to a parallel aligned condition. Similar precautions are taken to insure a correct angular relationship between the piston skirt and piston pin bore.

In following the results of these provisions through and checking the condition of the engine after a period of operation, some evidence of connecting rod misalignment was found on the piston skirts. Analysis naturally led to an investigation of the cylinder assembly operation in which the block was rocked down over six or eight pistons. It was found that a considerable leverage is developed if the block is not brought down exactly straight, particularly when the first piston has entered its cylinder barrel. Unless the cylinder block is cor-

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rectly supported, its entire weight tends to bend the rod and consequently to nullify all of the previous precautions.

With the new fixture, the cylinder block is picked up by an air hoist which is suspended from two parallel overhead rails and is carried across the aisle from the delivery table to the installation fixture. At its lower end the ram of the air hoist is equipped with a heavy yoke having surfaces which engage squarely with the top surface of the cylinder block. A close fitting hole in each end of this yoke passes over one of the cylinder head studs upon which a hand nut is screwed to support the block as shown in Fig. 1. The ram then is elevated and the whole unit, including hoist and cylinder block, are pushed across the aisle to the position shown in Fig. 1.

How Cylinder Block Is Piloted

At the back of the yoke which fits on the foot of the ram are two long bushings which engage with heavy vertical arbors that are in turn positioned to pilot the cylinder block down on the approximate center line of the crankcase. A slight discrepancy may exist between the two centerlines, as the crankcase is carried on rollers which engage with the parallel tracks shown, but any effects of this discrepancy do not become apparent until the block is clear down over all of the pistons and therefore are unimportant.

The two pilot arbors are the topmost members of the stationary portion of the fixture, the legs of which support and align the rails of that section of the assembly line as shown in the foreground of the illustrations.

At the back of the body of the fixture is another pneumatic cylinder, the centerline of which is at right angles to the assembly track. The ram of this cylinder actuates a cross slide which carries three heads, one for each pair of engine pistons in the case of the six-cylinder fixture which forms the subject of this description. These heads are mounted on a common frame and each of them is fitted with a clamp that squares up and contracts the rings of one pair of pistons. Two of these clamps are shown in the closed position in Fig. 1, while the third is shown with the snap cap removed.

In operation, the crankcase is brought under the fixture and the flywheel is locked by a link and a pin so that the rods are retained in the position shown in Fig. 1. The cross slide then is advanced by admitting air pressure back of the piston of the horizontal cylinder. The caps are then applied to the three clamping heads, contracting the rings and centering the pistons with the centerline of the cylinder block as it is piloted by the vertical arbors. The yoke which carries the cylinder then is lowered and the pilot bushings engage with the arbors, causing the block to come down in absolute alignment with the pistons.

Ring Clamps Work on Vertical Slides

Each of the three clamping heads is constructed with a short vertical slide which allows the weight of the descending block to slip them down the pistons until the block has reached the point shown in Fig. 2, when the rings are well within the cylinder barrel. Due to the fact that the middle pair of pistons is approximately on upper dead center, the travel of the corresponding slide is much greater than that of the two end pairs.

During the entire down stroke of the carrying yoke, air is admitted to a small vibrator which is shown near the top at the right of the centerline. The action of this vibrator, which is the usual bench molding pneumatic type, replaces the hammering and twisting which usually is applied when blocks are assembled by hand.

When the block has reached the lowest point of the travel of the vertical clamp slides, the caps are removed and the entire cross slide is drawn back to a clear position by reversing the pneumatic control valve. As the clamp heads clear the cylinder block they are returned to their original upper position by inclosed coil springs. The cylinder block then continues downward until the base reaches the studs in the top of the crankcase when some slight shifting may be required to register the studs and their respective holes. In many cases the cylinder slips cleanly down over the studs, but any necessary shifting at this stage has no effect on rod alignment. The final position is shown in Fig. 3. The hand nuts then are removed from the studs at the top of the block and the yoke is elevated and moved across the aisle to be attached to the next cylinder block.

A somewhat similar fixture for the eight-cylinder engine is installed next to the six-cylinder fixture, as both types are assembled in a common line. With the exception of the clamp construction which represents an earlier form, the same features are maintained in both installations. In the phraseology of one of the operators, the installation of the cylinder blocks was "some job" prior to the adoption of this equipment.

At present this formerly troublesome station practically sets the pace for the line and the two station operators are able to set up all of the mounting nuts that can be handled with a speed wrench. But still more important, rejections and overhauls due to misaligned rods during the tear-down have been practically nil since the installation of this equipment.

WHEN ignition units are mounted on the generator it is customary to place them at the commutator end. There is one good reason, however, for mounting them on the driving end, as it is then possible to liberally lubricate the ignition unit driving gear without risk of oil getting onto the commutator and brushes.

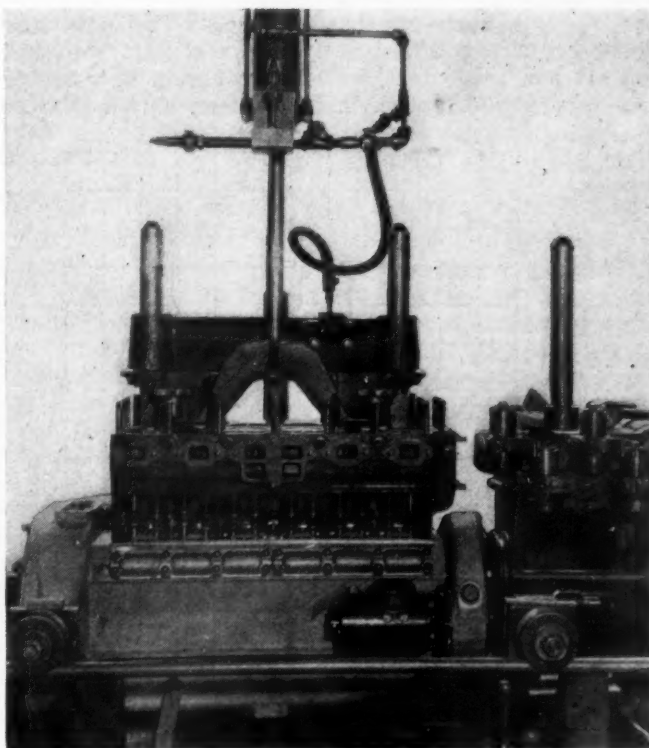


Fig. 3—Final position just before removing hand nuts. Note flywheel lock pin and link at extreme left

Strength of Mixture Has Marked Effect on Engine Temperature

Influence not always realized sufficiently. Recent researches show relationship. Experiments indicate detonation is function of rate of flame propagation.

By C. B. Dicksee,

Westinghouse Electric & Manufacturing Co.

ALL designers are aware of the important bearing which temperature has upon the satisfactory operation of internal combustion engines. The smoothness of operation is largely dependent upon the temperature of the combustion chamber which determines the nature of the combustion which takes place.

This frequently is illustrated in a forcible manner when a layer of carbon causes an increase in temperature of the inner surface of the combustion chamber. A small spot reaching an excessive temperature may entirely spoil the operation of an otherwise excellent design. In addition to this, differences in temperature between adjacent points may easily produce stresses greatly in excess of those anticipated and eventually produce mechanical failure.

The effects on economy of a change in mixture proportion are well known, but the influence which mixture proportion has upon temperature does not seem to be as fully realized. That there is a subconscious realization is shown by the frequency with which a rich mixture is adopted as a remedy for "pinking." It is generally assumed, however, that the excess fuel acts as a diluent and therefore reduces the rate of flame propagation. It has this effect, but the reduction in temperatures throughout the whole cycle when a rich mixture

is used, and consequently of those of the engine, has a very considerable bearing on the matter.

The purpose of this article is to analyze the mixture upon which the engine usually operates and to illustrate by experimental figures how any change of mixture proportion influences the temperature of the engine.

Factors Involved in Heating

The temperatures developed by the gases within the cylinder are governed primarily by the mixture strength, i.e., the ratio of air to fuel supplied to the engine, and will depend upon

- (1) the quantity of heat liberated during combustion,
- (2) the weight of gases by which this heat is absorbed,
- (3) the specific heat of the products of combustion,
- (4) the heat lost to the cylinder walls during combustion.

We will consider these in order.

(1) The quantity of heat liberated will depend upon the quantity of fuel present in the mixture, the heat available per unit weight of fuel, and the proportion of the available heat which is actually liberated upon combustion. A certain minimum quantity of oxygen, (and, therefore, air) is required per unit weight by every fuel, and a mixture containing this or a greater amount of air will liberate on combustion the whole of the available heat.

With mixtures containing a lesser amount of air the combustion will be incomplete, some of the carbon burning to carbon-monoxide, which results in a loss of heat. The extent of this loss is illustrated by Fig. 1, which is taken from Dr. Watson's figures. The quantity of heat liberated, and, consequently, the temperature developed on combustion, is therefore a function of the mixture strength. Ricardo has pointed out that the heat value of a given volume of the theoretically correct mixture is practically constant for all fuels suitable for use in automobile type engines.

(2) The weight of products by which the heat is absorbed is again a function of mixture strength. One pound of fuel when mixed with n lb. of air produce $(n + 1)$ lb. of mixture, and if H is the heat available per pound of fuel, the heat available per pound of mixture will be $H/(n + 1)$. As already pointed out, if n is less than the theoretical amount, combustion will be incomplete and all the available heat will not be developed.

Fig. 1 also gives a curve showing the quantity of heat liberated per pound of fuel and per pound of mixture, on the basis of a fuel corresponding very closely to common gasoline and having a lower calorific value of

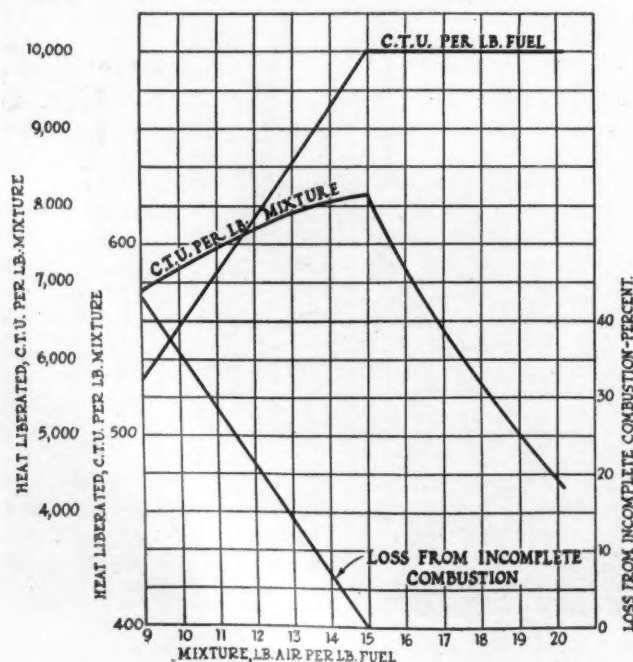


Fig. 1

10,000 CTU/lb*. This shows that the heat liberated per pound of mixture is a maximum for the theoretically correct mixture proportion, and as in this case all the heat is liberated and there is no excess air to absorb heat, the temperature developed also will be a maximum.

(3) The specific heat of the products of combustion has been the subject of a considerable amount of investigation. Accurate values are difficult to determine and absolute values are not available. It has, however, been established beyond question that the specific heat increases with the temperature. Also, the specific heat of carbon dioxide is greater and increases more rapidly than that of the other constituents of the exhaust gases. But as the carbon dioxide cannot exceed 14 per cent by volume of the total exhaust gas with gasoline and a slightly larger amount with benzol, the effect of a change in CO_2 content upon the specific heat of the whole mixture is small and for all ordinary calculations may be neglected. Fig. 2 is a curve giving values of the total energy per pound of gas at different temperatures. This, of course, involves the specific heat and is based on average values for the apparent specific heat.

(4) The quantity of heat lost during combustion will be some function of the temperatures reached while this process is going on. Thus, the heat lost during the expansion and exhaust strokes and the rate at which heat is removed from the outer surface of the walls are the factors governing the temperatures reached by the cylinder and combustion chamber.

Dilution of Residual Gases

The mixtures referred to above are of fuel and air only; that is, mixtures as supplied by the carburetor. The mixture upon which the engine operates is of somewhat different composition, as it contains the residual exhaust gas which has remained in the combustion chamber from the previous cycle. This exhaust gas acts as a diluent, and, by increasing the weight of gases by which the heat liberated during combustion is absorbed, reduces the maximum temperature.

While the residual exhaust gases, together with the nitrogen of the air, act as a diluent and reduce considerably the heat value in a given weight or volume of charge, it is far from correct to suppose that they serve no useful purpose. Without nitrogen the temperature would become destructively high, the pressures would be difficult to control and excessive detonation would make operation impossible.

The exhaust gases serve the same purpose and the increased tendency to detonate with higher compression ratios is in a degree due to the reduction in volume of the residual gases resulting from the smaller compression volume. The value of the exhaust gases in suppressing detonation has been shown in attempts to scavenge the compression space and obtain a charge of 100 per cent fresh gas. Such attempts always lead to detonation troubles.

Charge Dilution and Rate of Flame Propagation

Recent investigations go to show that detonation is a function of the rate of flame propagation. When this reaches a certain value, detonation will take place. The presence of a diluent reduces the rate of flame propagation and thus tends to prevent trouble. Apart from this the presence of the diluent tends in a certain measure to increase the efficiency by reducing the maximum temperature. With a lower temperature, not only is the loss due to the increase of specific heat reduced but also that by direct cooling during combustion. This is

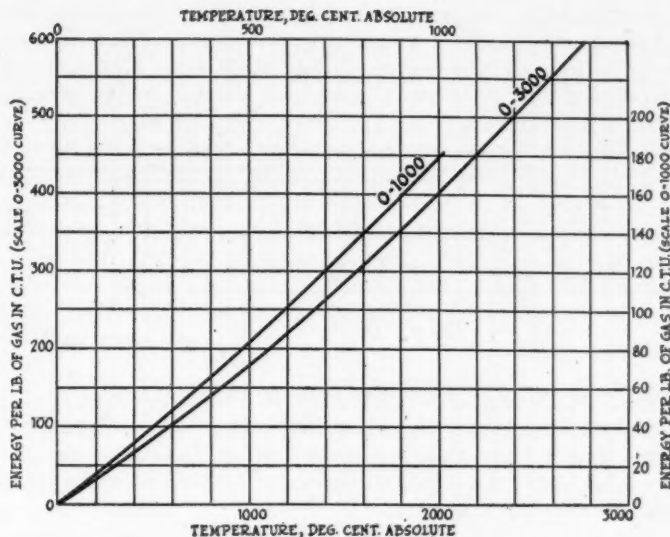


Fig. 2

clearly shown by Ricardo's stratified charge engine (Trans. S.A.E., 1922, Part 1, p. 29).

The relative volumes of fresh and exhaust gases in the mixture can be fairly readily ascertained, but for temperature investigations the proportions by weight must be calculated. The volume of the exhaust gases will obviously depend upon the compression ratio and the pressure of the gases at the end of the exhaust stroke, while the volume of fresh gas will depend upon the volumetric efficiency of the engine. The relative weights of the two parts will be proportional to their volumes and their absolute temperatures.

Let us take the volume of fresh gas first. As already stated, this will depend upon the volumetric efficiency of the engine. This latter is governed not only by the resistance offered by the induction system to the passage of the gases, but also by the heat absorbed by the charge in coming in contact with hot surfaces during admission. The heating of the charge by admixture with the residual gases has no effect upon the volumetric efficiency, as the loss in volume suffered by the exhaust gases due to the change in temperature on mixing with fresh gases exactly balances the increase in volume of the fresh gas.

Temperature Drop Due to Vaporization of Fuel

For purposes of investigation, therefore, the fresh and exhaust gases may be considered as remaining unmixed until the inlet valve has closed. The heat picked up during induction is to a great extent offset by the heat required to vaporize the fuel. This is by no means a negligible quantity, as will be understood when it is realized that the latent heat of evaporation of gasoline is about 75 CTU/lb. This means that if all the heat required to vaporize the fuel could be supplied by the mixture itself there would be a considerable drop in temperature, with a corresponding increase in density of the fresh gases. Ricardo gives a figure of 21 deg. C. for hexane and 83 deg. C. for ethyl alcohol, obtained by actual measurement.

It is, of course, impossible to state exactly how much of the fuel is evaporated before the inlet valve closes, but there is undoubtedly an increase in volumetric efficiency due to this cause, as is illustrated by the experimental results given later.

The temperature of the fresh gas after admission and before mixing with the exhaust gases is important, as it affects not only the volumetric efficiency, but the temperatures throughout the whole cycle. It is somewhat

*18,000 BTU, 1 Centigrade Thermal Unit=1 lb. water x 1 deg. C=1.8 BTU.

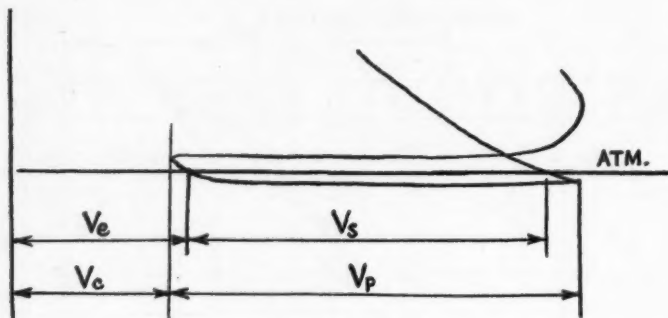


Fig. 3

difficult to obtain accurately, but if means are available for obtaining the true volumetric efficiency and at the same time taking reliable weak spring indicator cards, the final suction temperature may be calculated with a fair degree of accuracy.

Fig. 3 represents a typical weak spring card. From this may be obtained both the volume of exhaust gases retained and the indicated volumetric efficiency. The indicated volumetric efficiency will be greater than the true value as obtained by measuring the air supplied to the engine. The difference is due to the heating of the fresh charge and will be proportional to the difference between the absolute temperatures of the charge before and after admission. Referring to Fig. 3, if V_e is the compression volume and V_p the volume swept by the piston, then V_s (the distance between the two points where the suction and compression lines cross the atmospheric line) will represent the volume of fresh gas admitted measured at atmospheric pressure and admission temperature. The indicated volumetric efficiency will be given by the expression V_s/V_p . Then, if T_c is the temperature of the air at the carburetor intake, measured on the absolute scale, the temperature of the charge after admission (but before mixing with the residual gases) will be given by the expression

$$T_a = \frac{T_c \times \text{Indic. vol. eff.}}{\text{Abs. vol. eff.}}$$

Thus, to take a specific case, if the indicated volumetric efficiency is 85 per cent, the volumetric efficiency at room temperature is 72 per cent, the air at carburetor intake 27 deg. C. (300 deg. abs) the temperature of the charge before mixing with the residual gases will be

$$\frac{300}{72} \times 85 = 354 \text{ deg. abs} = 81 \text{ deg. C.},$$

a net increase of 54 deg. C. during admission. The true gain in temperature is, of course, somewhat greater, owing to the cooling produced by evaporation of the fuel, as mentioned above.

Temperature of the Residual Gases

The fresh charge may now be considered as containing either 85 per cent of the swept volume of fresh gas at 354 deg. C. abs., or 72 per cent at 300 deg. C. abs.

Obtaining the temperature of the residual gases is a somewhat easier problem. The temperature of the gases within the cylinder at the end of the exhaust stroke cannot be materially higher than the temperature of the gases in the exhaust pipe, if this is measured as near the exhaust valve as possible. The temperature of exhaust gases will be governed by the temperature reached on combustion, the degree of expansion during the working stroke and also the heat lost to the cooling system. The load upon the engine has a very great

effect, but full load conditions only need be considered, these being the most severe. The conditions at any other load may, however, be investigated by the method here described, if required.

Fig. 4 gives the variation of exhaust temperature with mixture, the temperatures being those at full load and measured immediately outside the exhaust valve of one of the air-cooled engines built by the writer's firm. Actual values will, of necessity, vary somewhat with almost every design, but the curve gives the general characteristics for all engines.

As already stated, the volume of the residual gases will depend upon the compression ratio of the engine and the pressure at the end of the exhaust stroke and may be obtained from a weak spring diagram. Referring again to Fig. 3, V_e will represent the volume of the exhaust gases referred to atmospheric pressure and exhaust temperature.

The method of finding the actual composition of the cylinder charge is best illustrated by an example. Suppose an engine having a compression ratio of 4.0:1 is supplied with a 15 to 1 mixture and has real and indicated volumetric efficiencies as given above. From the weak spring diagram it is found that the volume of exhaust products measured at atmospheric pressure is equal to the compression space plus 5 per cent of the swept volume. In want of better information, the temperature of the exhaust gases may be taken from Fig. 4 and will be found to be about 740 deg. C. or 1013 deg. C. abs.

Composition of Cylinder Charge

Taking the total volume of the cylinder as 100 per cent, each charge will consist of

25 per cent + (5 per cent of 75 per cent) = 28.75 vols. of exhaust gases at a temperature of 1015 deg. C. abs.; and 85 per cent of 75 per cent = 63.75 vols. of fresh gas at 354 deg. C. abs. This means that there will be:

$28.75 \times (273/1013) = 7.75$ parts by weight of exhaust gas, and $63.75 \times (273/354) = 49.2$ parts by weight of fresh gas. The final temperature of the mixture will then be:

$$\frac{(7.75 \times 1013) + (49.2 \times 354)}{7.75 + 49.2} = \frac{7850 + 17,400}{56.95} = \frac{25,250}{56.95} = 443 \text{ deg. C. abs.}$$

The charge now consists of 49.2 parts by weight out of 56.95, or 86.4 per cent of fresh gas, so that the heat value of 1 lb. of charge will be only 86.4 per cent of that of 1 lb. of mixture as supplied by the carburetor. However, upon combustion this heat will be absorbed by 1 lb. of gases.

The above deductions are based upon the assumption that the weight of a unit volume of gas is the same after as before ignition. This is not strictly true, as there is a slight increase in volume after combustion with gasoline as fuel. The difference, however, is small enough to be neglected for all ordinary calculations though it is greater with rich than with lean mixtures. The change in specific heat of the residual gas also has been neglected. This will be small for the range of temperature considered and may therefore be ignored.

A mixture containing 15 lb. of air to 1 lb. of fuel will liberate upon combustion 626 CTU per pound (Fig. 1). The charge within the cylinder will therefore liberate

$$625 \times .864 = 539 \text{ CTU/lb.}$$

To obtain the final combustion temperature the total heat in the charge at the moment of ignition must be ascertained. The 539 CTU given above represents the increase in energy due to combustion, and to this must be added the energy already present in the charge at the

end of compression due to temperature. The temperature of the charge at the end of the suction stroke has been found to be 426 deg. C. abs. This will be increased by compression, however. The temperature at the end of compression may be calculated by the ordinary formula for the expansion and compression of gases:

$$T_c = T_s R^{\gamma-1}$$

where T_c = temperature at end of compression (absolute)
 T_s = suction temperature (absolute) = 426 deg. C.
 R = compression ratio = 4.0
 γ = 1.35 for gasoline engines.

From this equation we get T_c = 692 deg. C. abs. (nearly). Referring to Fig. 2, the quantity of heat represented by this temperature is 118 CTU/lb.

An allowance must be made for loss of heat due to cooling during combustion. From the work of various experimenters it would appear that this loss amounts to some 15 per cent. This will reduce the heat liberated during combustion to 458 CTU, making a total heat of 576 CTU/lb., which corresponds to a temperature of 2690 deg. C. abs. Some observers claim that there will be a certain amount of dissociation at such a temperature, but from some results recently published by Professor Bone (Proc. Royal Soc., May, 1923) it would appear that very little, if any, dissociation takes place at temperatures even considerably higher than that given above.

In any case, this is taken into account in the values for specific heats embodied in the energy curve Fig. 2, as measurements of specific heats at such temperatures are apparent specific heats and include any loss due to dissociation.

Effect of Change in Mixture Strength

The deductions arrived at below in the analysis of some actual test figures show the probable change in maximum temperature of combustion with mixture strengths ranging from 9.5 to 17.5 lb. of air per pound of fuel. While the actual values will vary with the conditions prevailing in the engine, the temperature variations in most engines will be of the order given.

The writer recently carried out some experiments in order to ascertain the effect actually produced by a

change in mixture strength. The engine used was air cooled, having a single cylinder of 3 3/8-in. bore by 5-in. stroke, with valves located in the head. Cooling was effected by a suction fan which produced an air stream parallel to the cylinder axis. The compression ratio was 4.0, and the carburetor fitted was readily adjustable by means of a needle valve. Gasoline was used as fuel throughout the test, though the engine is normally operated on kerosene. The velocity of the cooling air is relatively low, being approximately 3000 ft.p.m. over the cylinder, while that over the head itself cannot be more than half this figure, owing to the necessarily greater area of passage.

Mixture Proportion Ascertained

All the usual readings were made during the test, as well as those peculiar to the particular investigation in hand. The power output was measured by means of an electric cradle dynamometer which was adjusted for each test so as to keep the speed as near as possible to 1250 r.p.m. The ignition was also adjusted to the best position for each carburetor setting. Temperatures were read by means of thermo couples at various points on the outside of the cylinder and head. The readings quoted for the head are from an individual couple, while those of the barrel are the mean of four couples spaced equally around the circumference at each of the following points: (1) around the side of the combustion chamber midway between the top of the head and the top limit of piston travel, (2) level with the top of piston travel, (3) level with the bottom of piston travel.

Means were not at hand for the direct measurement of the air supplied to the carburetor. This is a somewhat difficult problem, unless a gasometer is available, owing to the pulsating nature of the suction of a single cylinder engine. The mixture strength was therefore determined from exhaust analyses by Dr. Watson's chart, and from this and the quantity of fuel used the air supply was calculated. Exhaust gas analyses were taken by means of an Orsat apparatus. While this method is not absolute, the consistency of the values obtained was satisfactory. A slight decrease in volumetric efficiency may ordinarily be expected with a higher cylinder temperature, but this cannot be great, and any effect from

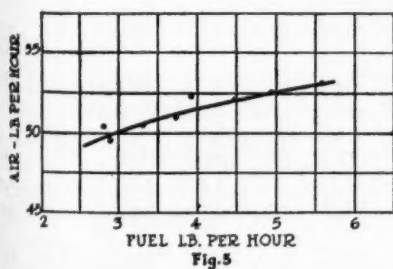


Fig. 5

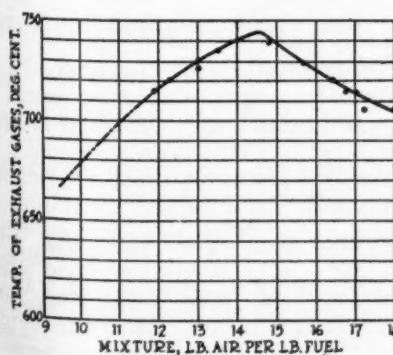


Fig. 4

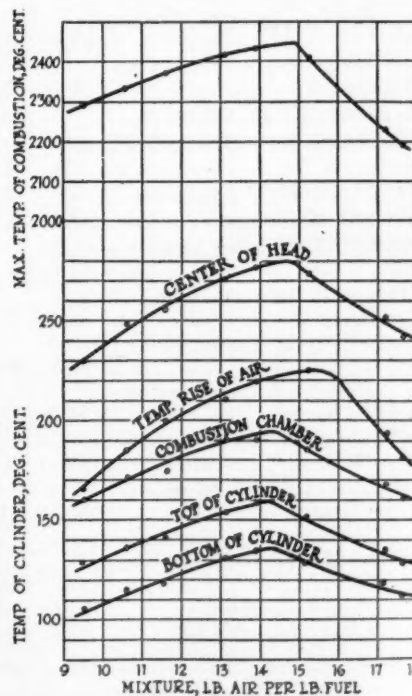


Fig. 6

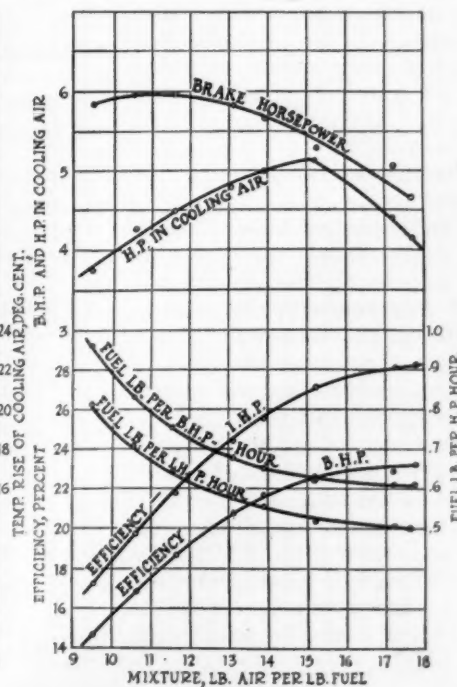


Fig. 7

Table I

Run No.	1	2	3	4	5	6	7	8
R.p.m.	1260	1250	1260	1250	1260	1240	1240	1250
B.hp.	5.9	5.97	6.0	5.82	5.71	5.24	5.04	4.66
Fuel, Lb./Hr.	5.64	4.94	4.54	3.94	3.72	3.3	2.90	2.83
Lb. Air/Lb. Fuel	9.5	10.6	11.6	13.3	13.8	15.2	17.0	17.8
Spark Advance	27	27	26	21	25	31	45	61
Vol. Cooling Air, Cu. Ft./Min.	300							
Temp. Cooling Air, deg. C.	30	31	32	33	33	34	34	34
Temp. Rise Cooling Air, deg. C.	16.5	18.5	20	21	22	22.5	19.4	18.0
Temp. Cent. Head, deg. C.	230	248	255	270	276	273	252	241
Temp. Av. Round Comb. Cham- ber	161	172	174	190	189	186	168	159
Temp. Av. Round Top Barrel.	129	136	140	153	157	151	136	128
Temp. Av. Round Bottom.	106	116	118	129	134	128	119	112
Barometer	738 m.m.							

this cause is more than offset by the cooling of the charge due to the vaporization of the fuel, as mentioned earlier.

This is clearly indicated by Fig. 5, which shows a decided increase in the weight of air with an increase in total weight of fuel supplied. This can only be due to the greater quantity of the more volatile constituents present resulting in a greater total evaporation and consequently a greater cooling of the charge.

The values for indicated volumetric efficiency and volume of residual exhaust gases could not be definitely determined, but numerous diagrams taken with a Midgely indicator show that the values taken cannot be seriously in error.

During the tests the only adjustments made were that of the mixture (which was changed by means of the needle valve in the jet, the throttle being clamped) and adjustment of the ignition and dynamometer as already referred to.

The readings taken during tests are shown in Table 1, which give all the usual readings together with the various temperatures recorded. Table 2 gives the values arrived at* in the analysis of the actual composition of the cylinder charge, as well as the various temperatures calculated. The slight error due to the fact that the mean speed of each run was not exactly 1250 r.p.m. was corrected when reducing the values given in Table 2. The temperatures measured

*In general, values are given to three significant figures.

the exhaust gases, Fig. 4, also has the same form. It may be as well to mention here that while these exhaust temperatures were not obtained at the time this particular

are not affected by the correction, as it has been found by experiment that at full throttle the temperature was practically unaffected by a change in r.p.m., there being only about 10 deg. C. difference between the temperatures at 700 and 1400 r.p.m.; hence it is unnecessary to make a correction for the few revolutions difference between the readings.

The various temperature readings are shown in Fig. 6, plotted against mixture strength. This curve shows very clearly the effect of a change in mixture strength upon temperature. It will be observed that in a general way the curves are identical with that giving the quantity of heat liberated upon combustion (Fig. 1). The curve of temperature of

Table II

Run No.	1	2	3	4	5	6	7	8
Fuel, Lb./Hr. at 1250 R.p.m.	5.60	4.94	4.50	3.94	3.68	3.32	2.92	2.83
Air, Lb./Hr. at 1250 R.p.m.	53.1	52.4	52.2	52.4	50.9	50.5	49.6	50.5
Air, Lb./Hr. at 1250 R.p.m., corrected from Fig. 5.	53.1	52.5	52.5	51.5	51.2	50.6	49.9	49.7
Corrected Mixture Strength, Lb. Air/Lb. Fuel	9.5	10.6	11.6	13.1	13.9	15.3	17.2	17.6
Volume of Air at Temp. and 738 m./m. cu. ft./hr.	755	747	744	735	731	729	715	713
Volume Swept by Piston, cu. ft./hr.	978							
Volumetric Eff. at Temp. and 738 m./m.	77.2	76.5	76.1	75.2	74.9	74.5	73.2	73.0
Indicated Volumetric Eff.	85%							
Temp. Fresh Gas at Entry, deg. C. abs.	334	338	340	346	347	351	357	358
Volume Fresh Gas per Cycle, cu. in.	34.8	34.4	34.3	33.9	33.7	33.5	33.0	32.2
Relative Weight of Fresh Gas per Cycle	31.3	30.9	30.8	30.3	30.1	29.8	29.3	29.2
Volume Residual Exh. Gases	15 cu. in. + 2.25 = 17.25 cu. in.							
Temp. Residual Exh. Gases, deg. C. abs.	943	963	983	1003	1013	1008	985	981
Relative Wt. Residual Exh. Gases	5.0	4.9	4.8	4.7	4.65	4.67	4.71	4.80
Total Weight of Charge	36.3	35.8	35.6	34.0	34.8	34.5	34.0	34.0
Fresh Gas in Charge, Per Cent by Weight	86.4	86.4	86.5	86.5	86.5	86.5	86.2	86.0
Final Temp. of Charge, deg. C. abs.	418	424	428	435	436	440	445	446
Temp. at End of Compression, deg. C. abs.	580	690	696	707	710	716	724	725
Energy at End of Compression, CTU/Lb. Charge	116	119	120	121	122	123	124	125
Energy Liberated by Combustion/Lb. Mixture	580	592	602	616	622	615	550	540
Energy Liberated by Combustion/Lb. Charge	501	511	521	534	538	532	475	464
Energy Liberated by Combustion Less 15 Per Cent Cooling Loss	426	435	443	454	457	453	404	394
Total Energy of Combustion	542	554	563	575	581	576	528	519
Temp. Reached, deg. C. abs.	2560	2600	2640	2680	2700	2680	2500	2460
Temp. Reached, deg. C.	2290	2300	2370	2410	2430	2410	2230	2190

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experiment was run, they were obtained from the same engine under similar conditions.

Table 3 illustrates even more clearly the interdependence of combustion and engine temperature. In this table the various temperatures are given on the absolute scale and also expressed as a decimal of combustion temperature. The degree of uniformity between the values at a given point for different mixtures when expressed in this manner is remarkable. The somewhat greater ratio apparent with lean mixtures may possibly be due to the lower rate of combustion which such mixtures give. The values, of course, are only applicable to this particular engine, but other engines must be influenced in an exactly similar manner.

While it is not pretended that the method of analysis here described will give absolutely accurate results, it is claimed that the results are at least relative and the uniformity of the values given in Table 3 go to substantiate the claim. If accurate means are available for obtaining both the quantity of air supplied to the carbureter and reliable indicator diagrams, it would seem that the method would be capable of a considerable degree of accuracy, which would then be dependent only upon the accuracy of the values of the apparent specific heat. The uncertainty as to the true values of the specific heat is a factor which enters into all thermodynamic equations and the method, therefore, cannot be condemned on that account.

The variations of B. H. P., fuel consumption, efficiency, etc., with a change in mixture strength, are shown in Fig. 7.

These experiments clearly indicate that when quoting any engine temperatures the mixture strength must be given also, if a comparison is to be made. The practice which sometimes prevails, of quoting mixture strengths based upon the assumption of 100 per cent volumetric efficiency, is to be condemned as being entirely misleading.

A point which may be noted is that the maximum temperature does not appear to be reached by all points on the cylinder for the same mixture strength. In fact, there appears to be a tendency for points more remote from the source of heat to reach a maximum for a somewhat richer mixture than points less remote. This was also noted by Dr. Gibson*, who found that the exhaust valve reached a maximum temperature with a somewhat leaner mixture than the cylinder head and valve seat.

Limiting Cylinder Wall Temperatures

The actual degree to which the temperatures are influenced will in a large measure depend upon the efficiency of the cooling system. With an air-cooled engine changes in temperature are readily detected. Opponents of the air-cooling system frequently claim that in no case can the temperature of a water-cooled engine cylinder exceed by more than a few degrees that of boiling water.

This claim is definitely disproved by some experiments recently published by Dr. Gibson in the paper already

Table III

Temp. Combustion, deg. C. abs.	2560	2600	2640	2680	2700	2680	2500	2460
Temp. Cent. Head, deg. C. abs.	503	521	528	543	549	546	525	514
Temp. Cent. Head/Temp. Combustion .....	.197	.201	.200	.202	.203	.203	.210	.208
Temp. Combustion Chamber, deg. C. abs.	434	445	447	463	462	451	441	431
Temp. Combustion Chamber/Temp. Combustion ..	.170	.171	.170	.173	.171	.168	.177	.176
Temp. Top Cyl. Barrel, deg. C. abs.	402	409	413	426	430	424	409	401
Temp. Top Cyl. Barrel/Temp. Combustion .....	.157	.157	.157	.159	.159	.158	.163	.163
Temp. Bottom Cyl. Barrel, deg. C. abs.	379	389	390	402	407	401	392	385
Temp. Bottom Cyl. Barrel/Temp. Combustion .....	.148	.150	.148	.150	.151	.150	.157	.156
Temp. Exhaust Gases, deg. C. abs.	943	963	983	1003	1013	1008	985	981
Temp. Exh. Gases/Temp. Combustion .....	.368	.370	.372	.375	.376	.376	.394	.400

referred to. In this paper he records temperatures as high as 215 deg. C. near the exhaust valve of a water-cooled engine. S. D. Heron also quotes a temperature of 238 deg. C. for a Liberty engine. This indicates that the temperatures of a water-cooled engine are much higher than is commonly supposed, and as these figures apply to clean engines, it can be readily understood that temperatures must be considerably higher in the case of an engine which has been in service for some time and has accumulated a layer of scale on the walls. Under such conditions a water-cooled engine will be every bit as sensitive to changes in mixture as an air-cooled engine.

It is true that a layer of dust on an air-cooled cylinder will have a somewhat similar effect to that of the scale in a water-cooled engine, but the dust is very readily removed, and since the dust will stick only to an oily surface it will be found that the combustion chamber is usually clean, because the heat and the air stream will usually dry off any oil. A sluggish water circulation, steam pockets and blisters due to a faulty design all tend to have a considerable influence upon the temperatures reached and increase the sensitivity to change in mixture. It may, therefore, be concluded that a change in the mixture proportion has practically identical effects on air-cooled and water-cooled engines.

British Adopt Standard To Determine Viscosity

AMONG the latest standards adopted by the British Engineering Standards Association is one pertaining to a method of determining the viscosity of liquids in absolute units. The specification is the work of a panel of the Aircraft Subcommittee on Chemicals and has received the approval of the Institution of Petroleum Technologists and several other interested technical societies. It gives standard dimensions for U-tube, co-axial bulb and falling sphere viscosimeters and specifies the standard liquids recommended for their calibration. The manner in which the instruments are to be used and calibrated is detailed.

For use in the determination of the viscosity of opaque liquids, the Lidstone viscosimeter and adaptations of the U-tube and falling sphere viscosimeters are described.

* Exhaust Valve and Cylinder Head Temperatures in High Speed Petrol Engines. Inst. Mech. Eng. Dec. 14th, 1923.

Fisher System Places Body Repairs on Par with Chassis Service

Units and bodies so numbered that replacements can be made on short notice. Car distributors are supplied with parts books from which stocks are ordered.

By W. L. Carver

THAT the automobile body is coming into its own as an intrinsic part of the general scheme of engineering, manufacture, sales and service is demonstrated by the service plan and facilities of the Fisher Body Corporation. Service in the accepted sense generally comprehends the delivery and replacement of worn or damaged parts which are identified with the chassis and running gear. In this direction, considerable progress has been made, so that the customer's recognition and demand for what may be termed mechanical service is an important part of the fabric of the industry.

On the other hand, a similar service as related to the body of the car has been largely an unexplored field. The average customer fairly raves at the slightest hitch in the mechanical side of the service program but both customer and dealer in a majority of instances have been content to send the car having a damaged body or torn trimming and upholstery around to a tin shop or tent and awning maker for repairs. In the larger centers this work is handled to somewhat better advantage by custom body and trimming shops but the expense is great, the expenditure of time is similar and the matching of fabrics and hardware is not always accomplished.

Body Service Improved

This peculiarity of service psychology arrives naturally from the comparatively obscure position that the body has heretofore occupied in the plans of the industry. From the beginning until very recently, attention for the most part has been concentrated on the power plant and chassis. Engineers devoted months, even years, to the development of the complete chassis, giving little or no attention to body lines or body mounting. The finished chassis then was turned over to the body department or a commercial body company who did its best to round out an automotive vehicle in the face of the arbitrary limitations already designed into it. The idea of the horseless carriage with emphasis on the "horseless" overshadowed that of complete automotive development. Bodies were more or less an afterthought and consequently their manufacture and service lagged behind the automotive procession. Only recently have the demands of comfort and appearance in addition to transportation value brought them into their proper position of prominence.

In organization, the service department of the Fisher Body Corporation bears considerable resemblance to the makeup of that of the large car manufacturer. The department has been organized on the present basis for about three years and in that time has outgrown a four-story building having more than 60,000 sq. ft. of floor space. In addition to office space, the department comprises a very complete stock room and a well-equipped, self-supporting repair shop. While the physical equipment of these de-

partments is fairly conventional, the organization and correlation are such that 75 per cent of all orders are filled on the day of receipt and 95 to 98 per cent are shipped within 24 hours. Most of these orders apply to bodies which have been made since the beginning of 1920, although similar service is rendered on all bodies which have been produced by the company.

Distributors Carry Body Parts

Orders are received chiefly from car manufacturers' distributors and involve parts for closed bodies for Cadillac, Buick, Oakland, Olds, Chevrolet, Dodge and Wills-Ste. Claire cars. Parts for some closed models for Studebaker are ordered direct from the factory. These distributors are supplied with parts books, which are in turn forwarded to all dealers, upon receipt of information regarding their appointment from the parent car manufacturer. Practically all of the distributors carry stocks of the rapidly moving units such as windshields and their component parts, outside door handles, trimming hardware of every description, floor carpets and some glass. Many of them carry completed doors, although the color consideration precludes the fullest possibilities of service stocking for this particular part. A growing tendency toward carrying body service stocks by dealers is shown, although the greatest obstruction to this move thus far has been the dealers' ignorance of the possibilities of body service which is the outgrowth of the general neglect of body considerations which has characterized almost the whole industry.

Distributors' orders are based on illustrated parts books which cover all details of the specific body. As illustrated by Fig. 1, which is two adjoining pages of a representative parts book, the desired part is identified by a symbol number by which it is ordered, a description in detail and an illustration number which refers to the cut on the opposite page. In addition to this, the number required and the list price per piece or assembly is also listed. At the bottom of each page of type is the note "Always Specify Body Number." In addition to its usual commercial uses, this stipulation really points to the foundation that makes this service plan possible. Without a very definite record of all of the details of each body the organization of a service of this scope would have been practically impossible.

Single Symbol Number Used

As stated previously, all parts are identified by the engineering department's symbol number, which was assigned as the body was designed and retained throughout the course of manufacture. In addition to this feature, a comprehensive manufacturing record has been kept for each individual body. This record carries both

the job number and body number of each body as it is completed. Types of upholstery and the materials used, as well as the type and style of all the hardware, are definitely specified so that reference to the two numbers produces an exact idea of the proper material to be supplied in service. In other words, from the very first all bodies have been regarded and treated as true articles of manufacture when the term is used in the quantity production sense.

Standard System Aids Repair Work

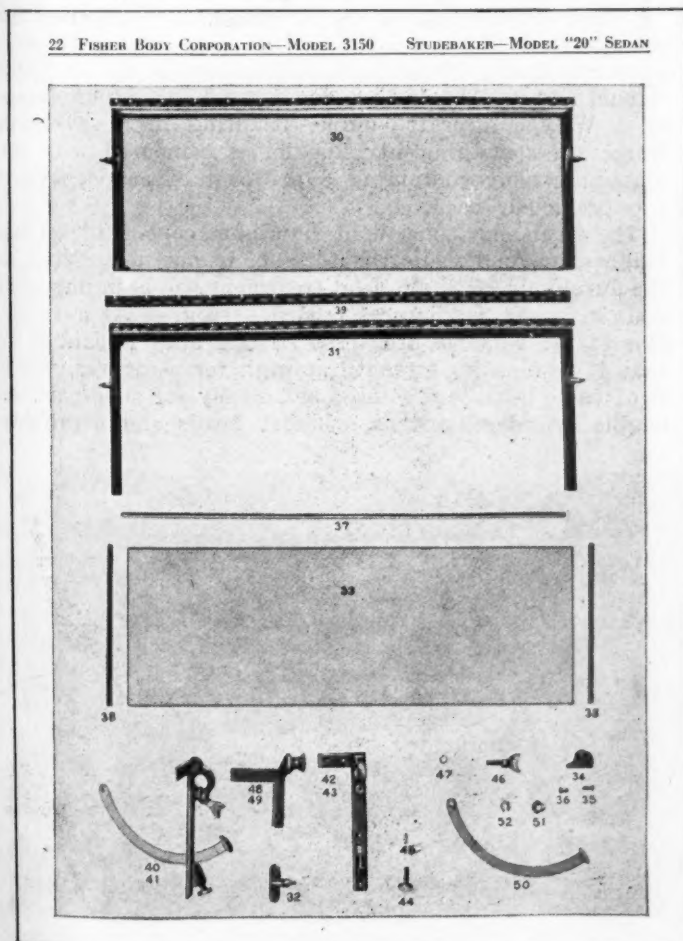
As the design and production of any type of body for any make of car are undertaken, a job number, which is a permanent identification, is assigned. In addition, each body is numbered serially as it is completed. This combination which constitutes the body number is stamped in the right front door sill and thus forms the permanent reference for every interested party from the customer to the service department or plant. Under custom body shop conditions these numbers would be of little value as there would be no assurance of interchangeability. In this case, however, bodies are manufactured throughout in a standardized manner.

An example of the value of this record as well as a tribute to the records of the service department was made recently by the following incident. The owner of a Cadillac sedan locked the doors of his car as he parked it in the downtown section of Detroit. Upon his return he discovered that his key had been lost in the meanwhile and access into the car was impossible. He immediately called up the service department, stating that he knew nothing of the body number but that he had purchased a key from the service department about a year previously. Reference was made to the business records of the department

which in turn gave the identification number of the former purchase. Within five minutes the owner was advised of the correct key number and was then able to obtain the key from the nearest Cadillac salesroom. On another occasion the owner of a 1915 Cadillac sedan was supplied immediately with a new door from stock.

Prompt service is founded upon an adequate stock which is made fully available by adequate records and location references. Some idea of the stock on hand may be obtained from the fact that there are at present more than 2000 doors in the service stock. More than 350 kinds of trimming material are carried in rolls, this figure including 144 different kinds of plush alone. Carpets are stored in the finished cut-to-size form with the binding in place. Plate glass for windshields and windows is carried in blocking sizes ready to be cut to the desired sizes. No effort is made at stocking the wood parts of the body frames and but few metal panel sections are carried as service stock since it is felt that any damage warranting the replacement of such parts is a rebuilding or complete replacement instead of a service function. Most doors are stocked in the priming coat as the variation in color schemes does not render a finished stock feasible. In many cases distributors carry finished doors for popular lines, but for others about ten days are required for finish painting. The bulk of the service business is in windshield parts, outside door handles and carpets.

In addition to the stock room facilities, the department is equipped with a complete repair shop which is altogether independent of the production department. The department is almost self-sustaining, drawing but little help from the production department on current models. Complete equipment for woodworking, metal forming and



FISHER BODY CORPORATION—MODEL 3150 STUDEBAKER—MODEL "20" SEDAN 23				
RAIN VISION WINDSHIELD				
Symbol	Name of Part	Ill. No.	No. Req.	Price Each
25531	Rain Vision Windshield Assembly—Consists of Glass Assembled in Channel with Clips and Retainers	30	1	\$22.50
25532	Rain Vision Windshield Sash Channel Assembly	31	1	9.00
22317	Rain Vision Windshield Swing Arm Bracket (weld to sash when installing)	32	2	.25
25566	Rain Vision Windshield Glass	33	1	11.00
25931C	Rain Vision Windshield Glass Clip	34	2	.25
15 x 861	Rain Vision Windshield Glass Clip Bolt	35	4	.05
38 x 801	Rain Vision Windshield Glass Clip Bolt Nut	36	4	.05
92 x 4050A	Rain Vision Windshield Glass Retainer—Top	37	1	.50
92 x 1187A	Rain Vision Windshield Glass Retainer—Side	38	2	.25
363 x 1300	Rain Vision Windshield Hinge (weld to sash when installing)	39	1	2.00
RAIN VISION WINDSHIELD SWING ARM AND UPPER WINDSHIELD HINGE				
23781	Rain Vision Windshield Swing Arm and Upper Windshield Hinge Assembly—Right	40	1	\$ 0.00
23782	Rain Vision Windshield Swing Arm and Upper Windshield Hinge Assembly—Left	41	1	5.00
23861	Upper Windshield Hinge Body Bracket and Clamp Assembly—Right	42	1	1.30
23862	Upper Windshield Hinge Body Bracket and Clamp Assembly—Left	43	1	1.30
21381A	Upper Windshield Hinge Body Bracket Knurled Screw	44	2	.50
78 x 119	Upper Windshield Hinge Body Bracket Plug	45	2	.05
22800F	Upper Windshield Hinge Thumb Screw	46	2	.60
23863A	Upper Windshield Hinge Thumb Screw Washer	47	2	.05
23857	Upper Windshield Hinge Sash Bracket—Right (weld to sash when installing)	48	1	.75
23858	Upper Windshield Hinge Sash Bracket—Left (weld to sash when installing)	49	1	.75
21388A	Rain Vision Windshield Swing Arm Assembled with Knob and Pin	50	2	2.50
39 x 441A	Rain Vision Windshield Swing Arm Bracket Nut	51	2	.10
41 x 440A	Rain Vision Windshield Swing Arm Bracket Lockwasher	52	2	.05
21747	Rain Vision Windshield Swing Arm Escutcheon Plate	53	2	.10
(For Illustration See Page 22)				
ALWAYS SPECIFY BODY NUMBER				

Fig. 1—Adjoining pages of a representative service parts book of the Fisher Body Corporation

welding is installed. This department not only handles the local repair business but also does a substantial business in the repair of doors, etc., which are shipped in from every section of the country. Upholstering is repaired or replaced, metal and woodwork of all kinds are handled, so that the department is in many respects a custom body shop without the usual limitations.

This department with its prospective plans for more adequate dealer body-service represents about the last

stage of the establishment of the car body as an intrinsic part of the whole unit. It has already been demonstrated that mechanical service plays an important part in car values, particularly as applied to resale prices. As mechanical service contributes to the ability of the car as a means for transportation, body service should contribute to continued comfort and appearance with a resultant improvement in the value of the entire unit. The sales department should profit as well.

Diesel Engine Used in New Benz Truck

BENZ & CO. of Mannheim has announced details concerning its new 5-ton truck fitted with a Diesel engine. Two views of the powerplant of this truck are shown herewith. The engine works on the true Diesel cycle, using a compression pressure of slightly over 500 lb. p. sq. in., the fuel charge being ignited by heat generated by the compression of the air.

No air compressor plant for injection purposes is used. The system of fuel injection seems to be similar to that employed in the Hvid engine. There is an ignition chamber on top of the cylinder, in which a small quantity of the fuel ignites spontaneously and forces the rest of the fuel into the combustion chamber in the form of a very fine spray.

It is claimed that the Benz-Diesel engine can be operated on any heavy fuel such as crude oil; that the engine can be idled for any length of time and that it will carry a full load immediately after an extended period of idling.

In external appearance this powerplant does not differ materially from the conventional truck engine. The individual cylinders have both the inlet and the exhaust valves in the head, which are inclosed under an aluminum cover and operated by outside pushrods. The ignition chamber is arranged between the two valves. As is customary in engines of this type, the cylinder heads are cast separately. The engine is fitted with a centrifugal governor, a Bosch electric starting motor driving the flywheel and a preheating tank for the fuel in the upper tank of the radiator. Lubrication is by pressure.

Starting of the engine is effected in two stages and usually by means of the electric starter. During the first stage the exhaust valves are lifted off their seats by means of a hand lever. The starting motor then cranks the engine over rapidly and the flywheel accumulates momentum. After a sufficient speed has been attained the exhaust valves are released by the hand lever, but they are prevented from closing entirely by small auxiliary cams.

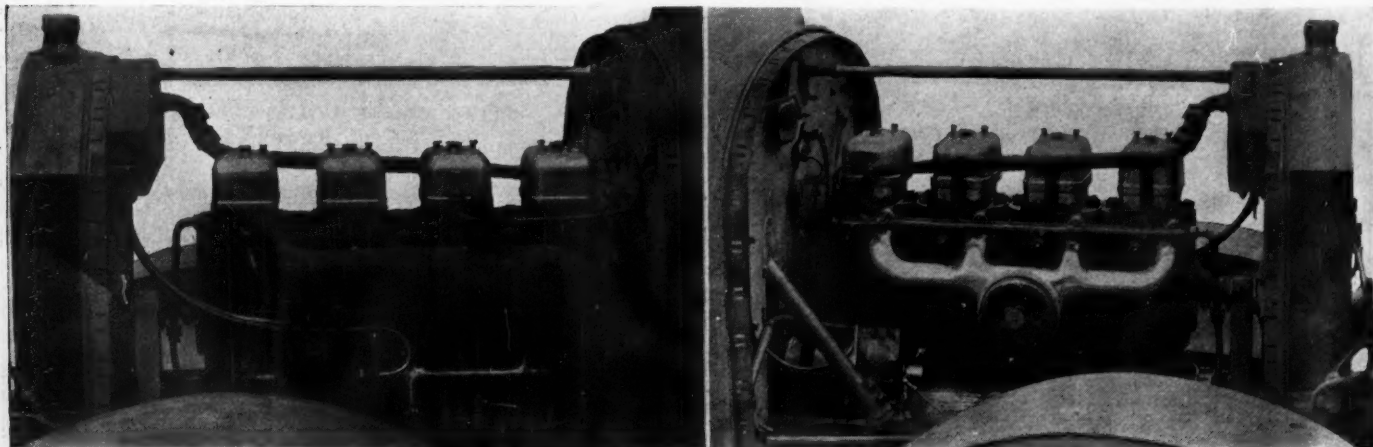
The result is that during the early part of the compression stroke a certain amount of the air which has been drawn in escapes again and the compression therefore is kept below its value in normal operation. Consequently, not sufficient heat is developed by the compression during this stage of the starting operation to ignite the charge spontaneously, and ignition is effected by means of an ignition plug which carries a filament which is maintained in an incandescent state by means of current from a storage battery.

After the first ignition the camshaft is shifted axially into its normal working position, whereby the auxiliary cams are put out of action and the current is cut off from the ignition plug. Thereafter ignition takes place entirely automatically.

The engine has four cylinders of substantially 5 in. bore and 7½ in. stroke, and is claimed to develop 50 hp. at 1000 r.p.m. The fuel consumption is given as 0.53 lb. p. hp.-h.

TWO new alloys have been introduced in aircraft engine construction by the Engineering Division of the Air Service, McCook Field. One is a light structural alloy containing 93 per cent magnesium, 5 per cent aluminum and 2 per cent zinc, and is used for the crankcase of a W-type aircraft engine, resulting in a saving in weight of something like 200 lb. as compared with the aluminum alloy containing 8 per cent of copper, which was previously used.

The other alloy consists of aluminum, copper, nickel and magnesium, and while the formula is not new, being of the duralumin class, the heat treatment has been improved and increased mechanical qualities secured as a result. One of the valuable properties of this alloy is said to be that it retains its strength at high temperatures, which is of value because it is used principally for such parts as engine cylinders, pistons, cylinder heads and manifolds.



Side views of the Benz-Diesel truck engine

Novel Gear Shifting Mechanism Chief Feature of German Bus

New Kastner gate change incorporates original design. Special method used for locking shifter bars has merit of compactness and simplicity. Device evolved to prevent swaying of rear end. Front axle steering pivot operates constantly in bath of oil.

By Benno R. Dierfeld

THE Mannesmann-Mulag Co. in Aix-la-Chapelle has brought out a new bus chassis which incorporates a novel gear shift arrangement, a special front axle and steering gear construction and other original design features.

In bus work gear-shifting is one of the most important operations to which the driver must give his attention, but with the old form of selecting mechanism, in which one shaft slides upon another when selecting gears, the sliding shaft is apt to stick in its bearing, owing to the great overhang of the level handles. Thus gear shifting is made difficult. This difficulty is obviated in the new Kastner gate change, as it is in the ball lever shifting gear now used almost exclusively on American cars.

Referring to Fig. 1, the gear lever A is guided in the gate in the usual manner and is adapted to swing laterally around the pivot B on the trunnion C. Part C oscillates with lever A in the housing D and contains a bearing for the shifter arm E. Lever A and arm E are connected by link F within the trunnion C. The principal advantage of this construction is that in shifting gears there occur only oscillating or rotary motions; sliding motions are obviated and no sticking of the parts can occur.

A novel method of locking the shifter bars has been introduced in this bus gear which has the merit of compactness and simplicity. As may be seen by reference to Fig. 2, there are three of these shifter bars, and they are arranged with their axes forming the points of an equilateral triangle. Lodged in a recess in the guide for

the shifter bars is a steel ball which extends into notches in the bars. The arrangement is such that when one of the bars is shifted out of the neutral position it forces the ball to the bottom of the notches in the other two, and thus locks them against endwise movement.

Rear End Sway Prevented

In order to prevent swaying of the rear end of the body, the device shown in Fig. 3 has been evolved. On top of the differential gear housing is mounted a double armed lever which normally extends fore and aft. From the ends of this lever, links with universal connections extend to the two side members of the frame. As the springs deflect and rebound, the distances between the ball joint on the differential and the joints on the frame vary, and this is taken care of by the swinging of the lever around its fulcrum. It is obvious, however, that, since the two links remain of the same length and the transverse motions of the ends of the lever are the same, the distances between the fulcrum axis and the frame side members must always remain the same, and there can therefore be no swaying.

For the new front axle design represented in Fig. 4 the advantage is claimed that the steering pivot operates constantly in a bath of oil. The stationary pivot pin is pressed into the axle end from below. The steering knuckle has an eye surrounding the knuckle pin, and into this eye is pressed a steel thimble which can be filled with oil. The weight on the axle is transferred from the knuckle pin to the thimble through a steel ball which is set slightly off center and describes a circular

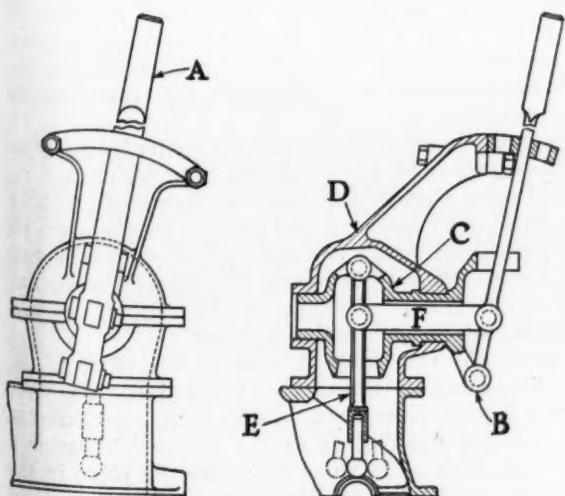


Fig. 1—Kastner gear selecting mechanism

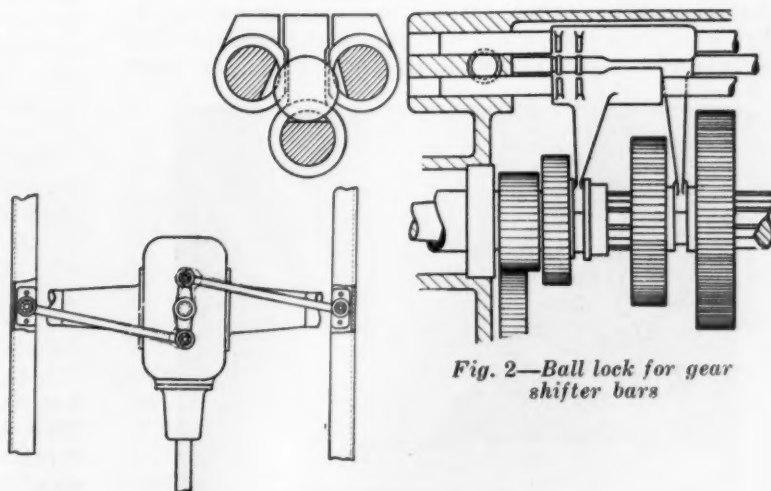


Fig. 2—Ball lock for gear shifter bars

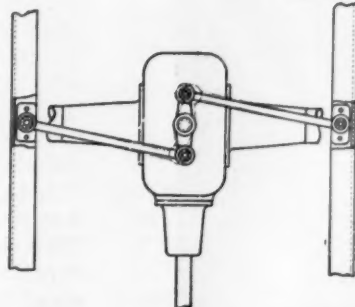


Fig. 3—Anti-swaying device for rear end of cars

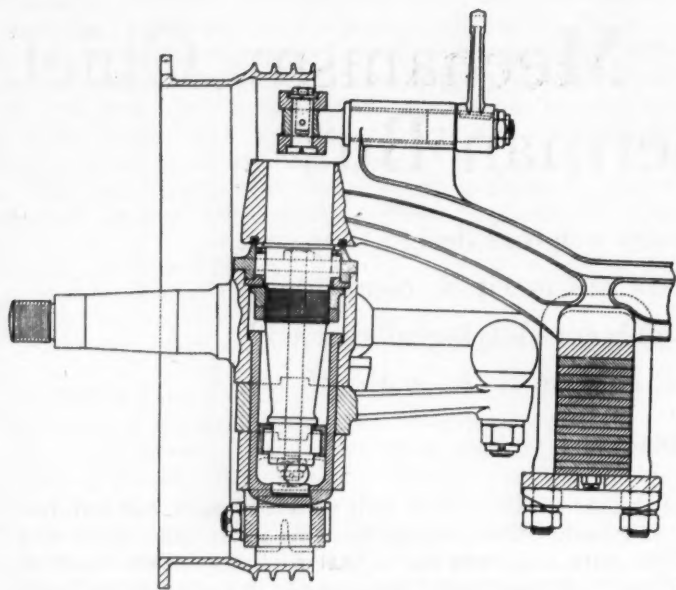


Fig. 4—Kastner
front axle design

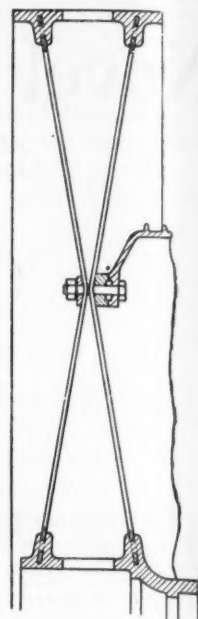


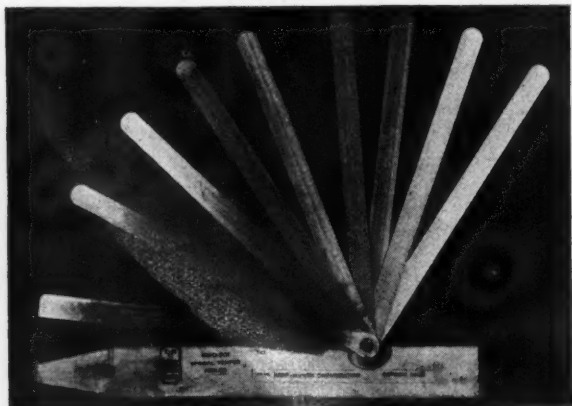
Fig. 5—Double
disk wheel with
hub and rim cast
onto disks

path when the steering knuckle swings around the knuckle pin. There are two cylindrical roller bearings on the pivot pin, near its upper and lower ends, respectively. Directly below the upper roller bearing there is a collar clamped into the steering knuckle, and below this another collar screwed over the knuckle pin. These are so adjusted that when the weight on the axle rests on the steel ball at the bottom of the knuckle pin the faces of the two come very close together and these parts, coating with the oil in the knuckle, serve as a dashpot, reducing the shocks on the wheel and axle. The oil needs to be replenished only at long intervals.

A new design of disk wheel for commercial vehicles also has been developed by the Mannesmann-Mulag company, as shown in Fig. 5. There are two disks of double cone shape. They are united at the joint of the two cones by means of bolts or rivets or by acetylene welding. Near their inner and outer edges these disks are provided with holes and are roughened. They are set into the molds and the hubs and rims are cast on, whereby a firm connection between the different parts is obtained.

Kent-Moore Produces Feeler Ribbons

FEELER ribbons are used largely in fitting new pistons, testing bearing clearances and a variety of other work, and they are found among the equipment of nearly every assembly room and repair shop. These



Feeler ribbon set

ribbons are generally made of shim stock, which is apt to be inaccurate, and very often they are rather short, making it difficult to use them for certain kinds of work. To overcome these deficiencies the Kent-Moore Organization, General Motors Building, Detroit, has brought out two sets of assorted sizes.

The ribbons of each KMO set are made from tempered Swedish spring steel and are claimed to be accurate. The first set contains eight sizes, as follows: .002, .003, .004, .005, .006, .009, .010, .015 in. The feeler ribbons are ½ in. wide and 8 in. long. This set sells for \$2.25 in a spring guard case, permitting one or more ribbons to be used at a time and the case acts as a handle. Another set containing five feeler ribbons of any of the above sizes is also provided. This sell for \$2.

New Specialized Slide Rule

A SLIDE rule by means of which all the essential dimensions of the full series of Swiss standard bolts, nuts and washers can be instantly determined has been developed and was exhibited at the recent international standardization conference at Zurich. If the slide is moved to such a position that the diameter for which the corresponding dimensions are sought appears in a window in the fixed part, all the other dimensions for that size of bolt appear in rectangles on a clear diagram of the bolt which is engraved on the fixed part of the rule. Thus, by merely shifting the slide the draftsman has before him a dimensioned drawing of the particular bolt he wishes information on.

The rule also provides means for conveniently showing the drill size to be used for a tapered hole which will receive the threaded part of the bolt, the diameter of cotter pin to be used, the effective cross section of the bolt, its safe carrying capacity and the unit stress on which this is based. On the back of the same rule there are similar presentations of the dimensions of two other common machine parts, shaft keys and gas pipes.

A sample of the rule may be seen at the office of the American Engineering Standards Committee, 29 West Thirty-ninth Street, New York, which is also prepared to furnish a detailed description of the device. There is a possibility that such slide rules will take the place in the drafting room of tables of dimensions of standardized parts made in a range of sizes.

New Volumes for the Business Bookshelf

MANY books have been written on the subject of repairing automobiles. Some of these are specifically for the purpose of enlightening car owners and some are considerably more advanced and for the purpose of educating the shop mechanic. "Automobile Repairing" by B. V. Elliott is quite frankly in between these two extremes. The material is not extremely elementary, yet it is sufficiently free from technical trade terms to enable a car owner to learn more about the mechanism of his car and take better care of it. On the other hand, the information is sufficiently advanced to enable an ordinary mechanic to become more proficient as a service station or garage employee. The volume is published by McGraw-Hill Book Co., New York, N. Y.

The first part of the book is devoted to the subject of tools. Tools necessary for service station work are listed and the function of each is explained briefly. Latter sections are devoted to the operation of the various units in the automobile, diagnosis and remedies for trouble. Practically all of the shop methods known to the modern service station are included in the book and the explanations and illustrations are sufficiently clear to enable any one with a mechanical turn of mind to fully comprehend everything involved.

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IN the progress toward higher working speeds, not only in internal combustion engines but in machine tools and other mechanisms as well, there is a constant necessity for reducing the weight of reciprocating parts, and it seems to have been this need that first led to the application of magnesium as a material of construction.

Metallic magnesium was first isolated by Humphrey Davy, the English chemist, in 1808, sixteen years before aluminum was discovered, yet the industrial application of aluminum preceded that of magnesium by a good many years. In fact, prior to the world war there was only one extensive application of magnesium, and that was for the production of flashlights in photography.

During the war period a shortage of copper and aluminum in Germany gave an artificial stimulus to the production of magnesium in that country, where it served as a substitute for the two metals mentioned. Intensive development, especially of a series of magnesium base zinc-aluminum alloys known as "electron," resulted in a relatively large increase in plant capacity and considerable effort toward fabrication of forms and shapes required for structural uses.

In this country it seems that magnesium production for flashlight purposes had died out previous to the war, but the cutting off of imports from Germany at the outbreak of hostilities revived the industry, and by 1918 five different firms had entered the field, the output in 1918 reaching a total of 248,118 lb. With the Armistice, war-time requirements ceased, but the possibility of magnesium as a light-weight construction material had come to be recognized and experimental work was continued.

The most likely application of magnesium for automobile work is for the pistons of high speed engines, and abroad it is already being used for this purpose to a considerable extent. Magnesium weighs less than two-thirds as much as aluminum in the pure state, and it is claimed that its alloys in beam and column form when

compared with aluminum alloys in the same form on an equal strength and equal deflection basis are superior in every case.

In order that the uses of the metal may be further extended it is of importance that information regarding its properties and methods of working should be spread among engineers and designers. This is the object of a book entitled *Magnesium*, recently issued by the American Magnesium Corp., which is affiliated with the Aluminum Co. of America. The book contains a brief history of magnesium as well as chapters on its metallurgy and its chemical, physical and mechanical properties. Other chapters are devoted to magnesium alloys, commercial forms, fabrication, surface finishes, chemical and structural uses and methods of analysis. In short, it is a very informative book and can be recommended to any one in need of information on the subject.

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THE results of very thorough practical experience in motor truck operation are incorporated in "The Motor Truck" by Edward A. La Schum, general superintendent, motor vehicle equipment, American Railway Express Co. The book constitutes a highly successful effort to explain thoroughly all the operation and construction details of the modern motor truck, without wasting much time on obsolete constructions. In one way it is an engineering treatise, and in another way it is not. No intricate formulae are to be found in the book, yet every principle of design and operation is thoroughly explained so that the engineer does not become impatient at the repetition of what he has come to regard primary school stuff, nor does the untrained reader find himself stranded amid highly technical language. Perhaps no other book on this subject has gone to the length that this one has in elucidating all the details of the motor truck.

The subjects are taken up in an orderly way, beginning with the power plant and its principles and working clear through till every detail of part and equipment has been thoroughly explained. So complete is the information that the book is, for the motor truck operator, a handbook of information often to be referred to. A complete analysis and presentation is made of the several motor truck cost systems and a complete index makes finding subjects very easy.

The author has had practical experience in the field of motor truck operation, probably second to none in the world. His position involves responsibility for the economical and continuous operation of thousands of motor trucks of every conceivable description. U. P. C. Book Co., 239 West Thirty-ninth Street, is the publisher.

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A NEW monthly publication called *Testing*, an international journal devoted to the field of testing materials, structures and machinery, is being published by the Pullman Publishing Co., Pullman Bldg., New York City. The first issue contains special articles by about a dozen contributors of standing in the field to which the publication is devoted. Engineers specializing in the testing of material or of whose work such testing forms an important part should find much of interest in the new monthly.



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Friendship with Latin-America

PRESIDENT COOLIDGE has lost no opportunity to make it plain that he favors cultivation of the closest possible relations with the Latin-American republics. Our interest in them commercially is as logical as our political interest is inevitable, but it has not always been properly stressed. Since Europe lost its importance as an export market, however, trade bonds with our neighbors have been more firmly cemented and as they have become better acquainted they have lost some of their suspicion of us.

The good fellowship which already exists will be placed on a more solid foundation by the Pan-American Highway Congress next May. All the nations to the south of us will send representatives to study the progress we have made in road building and the impressions they take home with them cannot fail to make for even more friendly relations. They need highway systems to permit the development of regions in the interior which will add tremendously to their national wealth, while we need markets for road

building materials and supplies and motor vehicles of all kinds.

Anything which will promote these desirable ends is reciprocity of the highest type. The automotive industry is supporting the Pan-American conference whole heartedly. In doing so it is aiding not only itself but the nation as a whole.

Dealers Needed in Small Towns

HIGH-PRICED car manufacturers in general did not experience nearly as great prosperity last year as did builders of cheaper products. While production does not measure profits in every instance, it might be expected in the natural course of events that the output of expensive vehicles would rise relatively as fast as that of low-priced models. That it failed to do so last year came as something of a shock to a good many executives.

"Why did the number of cars selling for over \$2,000," they are asking, "decrease actually as well as relatively in 1923 when the industry as a whole broke all output records?"

Some economists may say that the reason lies in a basic economic condition; that the high-priced car is on its way out and that its market is certain to become relatively smaller as time goes on. For a good many reasons this interpretation does not seem to be sound.

To begin with, the number of persons financially able to buy expensive vehicles is growing constantly as the population increases. There is nothing to indicate that the rate of increase of persons having good incomes is less than that of those having small ones, despite the fact that the number of million-dollar incomes is somewhat smaller than it was a few years ago. Persons who can afford something distinctive in motor cars have just as much desire for those qualities as ever. It is hard to see any fundamental economic reason for a relative drop in high-priced car sales, unless it be that manufacturers have found it possible to build a high degree of elegance and performance into lower-priced vehicles.

A more probable explanation of the falling off in expensive car sales is that manufacturers of these vehicles have been unable to solve successfully their distribution problem. While the large cities were virgin soil for automobile sales, the expensive cars could increase their output each year by distributing through a few agencies in urban centers. The saturation point is much nearer in large cities today than in rural and semi-rural areas, however. Wider distribution and more retail outlets are needed in the near future.

Over 50 per cent of the population of the United States lives in communities of 5000 population or less, and a large part of the potential market for expensive cars lies in such communities. How can these possible buyers be reached?

An exclusive dealer for a high-priced car cannot exist in a small town. Many companies making low-priced vehicles are insisting that their representatives

handle no other line of cars. Since the low-priced car is the small town dealer's meal ticket, he cannot afford to fight too hard for retention of the expensive car franchise. The result is that makers of cars selling for \$2,000-\$3,000 and over \$3,000 are finding it difficult to hold some of the representation which they have in small communities.

Some of the more prominent manufacturers of high-priced vehicles have increased their dealer organization by 20 or 25 per cent in the last three years. On the other hand, they have succeeded in increasing the proportion in small towns by only 1 or 2 per cent. There is reason to believe, moreover, that a good many small town dealers having agencies for high-priced cars do not put in much selling effort on such models.

To obtain and hold active sales agents in small towns is the big problem before the manufacturers of high-priced cars. Working agreement with some maker of low-priced cars, consistent newspaper advertising, practical assistance in selling through sound literature and intelligent traveling men, and factory aid in direct-by-mail and local advertising are some of the means which can be used to achieve the desired ends. The task is not easy, but necessity knows no laws.

The Trade Commission Goes Gunning

THE Federal Trade Commission seems to have gone even farther afield than usual in its citation against the Boston Automobile Dealers Association which it charges with suppression of competition by the fixing of maximum prices for the purchase of used cars. The fact that the practice was discontinued several weeks before the citation was issued has no especial bearing on the merits of the case.

The Federal Trade Commission contends that the "members of the association make sales of automobiles to purchasers located in States other than the State of Massachusetts and cause the automobiles so sold to be transported in some instances from their respective places of business in Boston into and through other States of the United States to such purchasers at their respective points of location."

This constitutes interstate commerce and brings the transactions within the jurisdiction of the Trade Commission!

Any one who knows anything at all about the automobile business knows how many motor cars Boston dealers are likely to sell to residents of States other than Massachusetts. The percentage is so small that the Trade Commission puts itself in the position of persecutor rather than prosecutor in classifying the business as interstate commerce.

If the commission were able to establish its allegations as facts the net result would be to compel Boston dealers to stop making sales to residents of other States, which would impose no hardship on them. What they do in their own State is none of the commission's business.

So long as members of dealer associations operating under used car plans similar to that developed in Boston abstain from interstate commerce they have nothing to fear from the Federal Trade Commission or the Federal anti-trust statutes. They should consult capable counsel, however, to learn whether or not they will come into conflict with some State law because several commonwealths have anti-trust laws more stringent than the Sherman statute.

Business Ethics Timely Topic

ETHICS in business will be one of the subjects included in the program for the annual meeting of the United States Chamber of Commerce at Cleveland early in May. In view of the Teapot Dome and other scandals it will be peculiarly timely. "Big business," generally speaking, has high ideals and it frowns upon questionable practices which involve Cabinet officers and other servants of the public. New definitions of ethics are valuable, now and then, because they are demanded by changing conditions, although fundamentals are the same today as they were yesterday and will be tomorrow.

Another subject to which a generous amount of attention will be given will be coordination of transportation. The studies of this problem made under the auspices of the Chamber of Commerce have been valuable and constructive, but the recommendations made can be carried into effect only by the force of public opinion as it will be formulated by shippers themselves.

Considerable opposition to the recommendations of the committee which considered railroad consolidations has developed in the central and far west. It has been led by the National Industrial Traffic League and is based, it must be confessed, on selfish considerations. Under the competitive conditions which now exist a great many municipalities enjoy preferential rate treatment and they fear they would lose this advantage if competing lines were merged into a single system.

Numerous Chambers of Commerce which are members of the national body and which have approved the recommendations of the transportation committees now find themselves in the position of having the stand they have taken opposed by the heads of their own traffic bureaus who hold membership in the N. I. T. L.

While a long battle impends before final agreement can be reached on railroad consolidation, unless it is settled arbitrarily by Congress, no controversial features stand in the way of general adoption of recommendations made by the committee which considered coordination of highway transport with other forms of transportation. Amazing progress has been made in the past year in the supplemental use of motor vehicles by steam and electric carriers, and 1924 promises to be even more remarkable in this respect.

This accomplishment alone will more than repay the Chamber of Commerce for its work in behalf of transportation coordination.

OUTLOOK GOOD FOR MARCH BUSINESS

THE outlook for automotive sales in the immediate future continues good all over the country. In general, February sales were slower in the northern part of the country, due somewhat to the bad weather experienced in that month, to the holidays, and to the usual slump in automotive buying at that time. The latter part of the month improved in retail sales and in practically all parts of the country sales exceeded last year to a considerable extent.

The strong features of the market are:

- (1) Fair business in February, with expectations of very good business in March, April and May.
- (2) General improvement in used car situation.
- (3) The absence of any overstock and fairly good financial condition of the dealers.
- (4) Distinct improvement in truck buying.
- (5) Better outlook in farm buying on cars, trucks and tractors.

The weak features of the market are:

- (1) Increases in repossessions on partial-payment cars in some districts.
- (2) The presence of unusually heavy stocks in some of the higher priced lines in some of the districts.

(3) Continuing difficulties in used cars in one or two sections of the country.

(4) A keener competition for spring sales among local dealers.

Closed car models continue to sell at approximately 50 per cent up, the higher priced cars reaching 80 per cent to 85 per cent closed jobs. The sales show considerable improvement in the high-priced lines in many parts of the country, although the low-priced cars are still in large proportion in one or two sections. Stocks range from poor to heavy; none of the monthly reports indicate that there is an oversupply of cars for spring business, and shortages are expected in some of the lines in some of the districts.

Truck sales are evidently improving and the outlook for bus sales is good.

The used car situation is better, according to the monthly reports at this time.

The general economic condition is good and the position of the automotive industry on raw materials favorable.

Conditions in chief distributing centers as reported by correspondents of AUTOMOTIVE INDUSTRIES are as follows:

Dealers Have Enough Stocks to Take Care of Early Demand

Atlanta

ATLANTA, GA., March 4—A much larger stock of spring merchandise will be carried by the dealers here this season than at any time since the inflation period immediately following the war, with a majority of the larger dealers confident that spring sales this year will be as large as they have ever been in the history of the automotive industry in Atlanta.

The recent southern show in Atlanta created a considerable interest, and while much larger sales than any previous shows were reported, the important feature was the number of new prospects secured, many of whom will buy cars this spring. Concentrating their attention largely on these new prospects dealers are looking for a big volume of business between now and summer, and in many instances are expecting to exceed their quotas.

Smaller town dealers attending conventions here during the show were even more enthusiastic, for with cotton holding firm above 30 cents a pound there undoubtedly will be a larger volume of sales to farmers of cars, trucks and tractors this spring than in some years.

Cincinnati

CINCINNATI, March 4—Cincinnati dealers report that the outlook for spring business is the best that they have ever had. Many inquiries have been received by local firms, and sales managers state that they are anticipating the closing of orders with a large number of prospects during the coming month. Sales held up

well during February, but dealers believe that they will take a big upward jump in March and April.

The used car market is in better condition than it has been for some time, and dealers are in a good position to handle trades when the selling season gets under way.

Retailers are stocked at present so that they can take care of new car deliveries promptly. At least this is the situation which will continue to prevail during March, unless unforeseen developments come up.

Sales of trucks have been a keen source of delight to dealers. Some dealers say that their truck sales are approximately 100 per cent ahead of the same period of 1923.

Business was stimulated considerably by the local show.

Seattle

SEATTLE, March 4—The spring outlook is the best in the history of the Puget Sound country. January topped every previous January, while February was not as good as that month but substantially ahead of February a year ago. Cars priced above \$1,500 are selling much better than last year, although Chevrolet sales have been outstanding in the last sixty days.

Dealers are fairly well stocked up, but are preparing to increase stocks in anticipation of excellent business in sight. There has been some improvement in movement of certain used cars and they are not such a drug on the hands of dealers as they were sixty days ago. Demand for trucks continues good.

Buffalo

BUFFALO, March 4—Buffalo automotive dealers profess themselves well satisfied with the outlook for spring. They are not overstocked but are well stocked, and are in a position to meet demands as they come along, during March and April, anyway.

No one can say just what conditions will be as to delivery after April.

Buffalo and the surrounding country experienced in February the first real cold weather of the winter. Up to that month there was not snow enough nor low enough temperature to interfere with driving. Cars, including open models, were as numerous on the streets of this city and on roads in the nearby country as in the summer time.

Then came the colder weather and deep snow of February that made driving difficult in town and almost impossible in the country. This slowed down sales.

Louisville

LOUISVILLE, KY., March 4—Prospects for spring sales among Louisville dealers may be set down as unusually good. The annual automobile show, which closed the latter part of February, proved an important factor in stimulating business. Dealers handling the more popular lines report that they have assurances from their factories of prompt deliveries in whatever volume desired, and it is as certain as can be in advance that the movement of automobiles from the centers of production toward Louisville will be greater than last year.

(Other conditions on page 583)

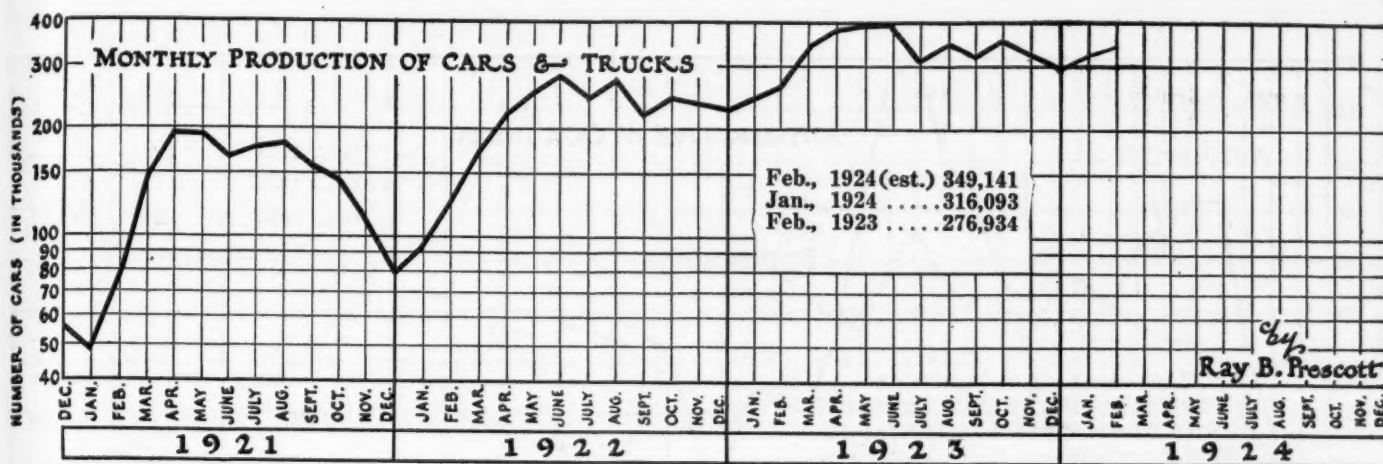
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OUTPUT LAST MONTH REACHED 349,141



New Daily Mark Set and Other February Records Shattered

NEW YORK, March 4—Shipping figures compiled by the National Automobile Chamber of Commerce place February production of cars and trucks at 349,141 as compared with 316,093, the revised total for January. This is an increase of 10 cent over February, 1923, which had 276,934. Although last year the increase over January, 1923 was 26 per cent it does not rob February of this year of the honor of showing the best production of any February.

The most astonishing feature of the report is the record for daily production, which is the best on the books of the industry. With only twenty-three working days because of two holidays, four Sundays and an otherwise short month, the daily average was 15,180 cars and trucks. This is comparable with last May when the industry turned out 394,088 vehicles, which stands as the monthly production record, the daily average being 15,157.

Record for Rail Shipments

Another record was broken in the month just ended, a new mark for rail shipments being established with 49,219 carloads as compared with 46,559 in January, this being the highest mark for any month in the history of the industry.

This fast pace is interpreted to mean that car manufacturers are making every effort to accumulate enough of a surplus to meet the spring business which they feel awaits them as indicated by returns

Production of Cars and Trucks in February Showed an Increase of 10 Per Cent Over the Previous Month

NEW YORK, March 4—Shipping figures compiled by the National Automobile Chamber of Commerce for February give an estimated production of 349,141 cars and trucks, a 10 per cent increase over January.

The following table gives the statistics for January and February of 1923 and 1924:

	Output		Carloads		Driveaways		Boat	
	1924	1923	1924	1923	1924	1923	1924	1923
January	316,093	243,539	46,559	35,223	40,976	30,031	1,018	728
February	349,141	276,934	49,219	36,165	48,300	43,613	1,100	882

Factory shipments for the other months of 1923 and 1922, and outputs for 1923 follow:

	Output		Carloads		Driveaways		Boat	
	1923	1922	1923	1922	1923	1922	1923	1922
March	355,030	172,984	44,983	27,753	62,988	16,917	1,908	560
April	382,695	219,864	46,095	31,334	60,467	22,381	5,027	2,960
May	394,088	256,559	45,397	33,416	62,346	28,827	12,812	7,406
June	378,507	289,351	40,281	34,230	59,099	33,857	13,492	7,737
July	327,993	247,132	32,623	29,116	46,837	28,100	10,131	7,030
August	345,202	274,184	38,319	32,817	45,958	36,768	10,053	10,104
September	327,549	207,156	35,986	26,335	39,653	30,177	8,463	8,118
October	365,189	239,361	42,236	27,100	37,947	35,203	7,663	7,605
November	312,993	237,301	38,133	27,232	32,859	27,376	6,413	5,070
December	303,154	228,364	34,984	27,244	27,608	26,743	4,000	1,307

Motor vehicle production segregated as to cars and trucks is as follows:

	1923			1923	
	Cars	Trucks		Cars	Trucks
January	223,819	19,720	September	298,911	28,638
February	254,773	22,161	October	335,023	30,166
March	319,770	35,260	November	284,923	28,070
April	344,639	38,056	December	275,434	27,720
May	350,410	43,678			
June	337,362	41,145			
July	297,330	30,663	1924		
August	314,373	30,829	January	287,296	28,797
			February*	314,141	35,000

*Estimated

from the show circuit and by orders from distributors and dealers. The comparatively mild winter has resulted in steady selling which has prevented the dealers stocking up to a very great extent, so that now the makers must travel at full speed to give their retailers cars enough when winter departs.

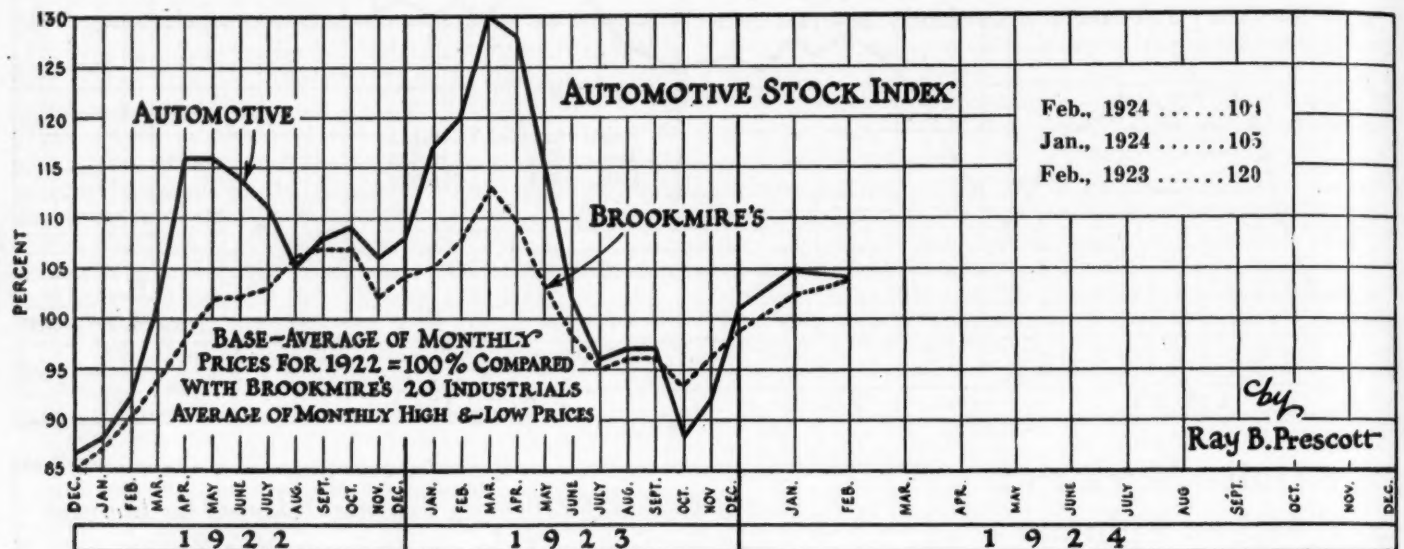
The feeling of optimism as to the immediate future is shared by the equipment makers as indicated by the statement of President G. Brewer Griffin

following the monthly meeting of the directors of the Motor and Accessory Manufacturers last week.

He said:

"There is nothing in the immediate situation to change the opinion expressed at the last board meeting. There is evident a certain amount of sensitiveness to the present political situation as indicated by the care with which commitments are made. The needs of the country, however, have not changed and a continuation of steady progress in the automotive industry seems probable."

AUTOMOTIVE STOCKS DROP SLIGHTLY



New York Exchange

	Dec. 31	Feb. 5	Mar. 4
Ajax Rubber.....	7 1/8	8 3/4	8
American Bosch.....	35 1/2	34 1/2	34
American-La France.....	10 3/4	10 3/8	11
American-La France pfd.....	91	94 1/2	95
Case, J. I.....	22 1/2	25	24
Case, J. I. pfd.....	68	75	67
Chandler.....	66 1/4	64 3/4	59 3/4
Continental Motors.....	6 7/8	7 1/2	7
Eaton Axle & Spring.....	23 1/8	23 3/4	23
Electric Storage Battery.....	60	61	62
Emerson-Brantingham.....	1 1/8	2	1 3/4
Emerson-Brantingham pfd.....	8	13	8
Fisher Body.....	165	175	205 1/2
Fisher Body of Ohio.....	97	97 1/2	99 1/2
Fisk Tire.....	8	9 1/8	8 1/4
Gardner Motor.....	5 7/8	5 3/4	4 7/8
General Motors.....	15	16	14 3/4
General Motors pfd.....	81	82	82
General Motors 6%.....	80 1/2	82 3/8	81 3/4
General Motors 7%.....	98 1/2	98 1/2	99 1/8
Goodrich B. F.....	22	24 1/2	21 7/8
Goodrich B. F. pfd.....	72	76	76
Goodyear Tire pfd.....	39 3/4	42 3/4	41 3/4
Goodyear Tire pr. pfd.....	88 1/4	91	92 3/8
Gray & Davis.....	7 3/8	8 1/4	6 1/2
Hayes Wheel.....	40	51 3/8	44 3/4
Hudson Motor Co.....	27 3/8	27 1/4	26 1/2
Hupp Motor.....	15 5/8	16 1/2	16
Indian Motorcycle.....	25	20 1/2	20 1/2
Inter. Harvester.....	77 1/2	86 1/4	84 3/4
Inter. Harvester pfd.....	106 1/2	107 1/2	106 1/2
Kelly-S Tire.....	32 3/8	28 1/2	22 1/4
Kelly-S Tire 6% pfd.....	75	73	72 1/2
Kelly-S Tire 8% pfd.....	85	83	66
Kelsey Wheel.....	96	97	100
Kelsey Wheel pfd.....	103	106	106
Keystone Tire.....	3 3/8	3 3/4	2 7/8
Lee Rubber.....	14	14 1/8	12 1/2
Mack Truck.....	90 1/4	89	89 3/8
Mack Truck 1st pfd.....	95 1/2	87	98
Mack Truck 2nd pfd.....	88	89	88 3/4
Marlin-Rockwell.....	7 3/4	11	11 1/2
Martin-Perry.....	35 5/8	34 1/2	33 1/2
Maxwell Motors A.....	49 1/2	53	51 1/2
Maxwell Motors B.....	13 1/2	14 3/4	14 3/8
Moon Motors.....	25	25 3/4	25 1/4
Mullins Body.....	12 3/4	14 1/4	12
Mullins pfd.....	89	89	89
Nash Motors.....	99	106	109
Nash Motors pfd. A.....	97	98	100
Ohio Body & Blower.....	2 1/4	3 1/4	2 1/2

Packard.....	12 1/2	11 3/4	11 3/8
Packard pfd.....	92 1/2	94	91
Parish & Bingham.....	13 3/8	14 3/4	14 1/4
Pierce-Arrow.....	8 3/4	10 3/8	9 3/4
Pierce-Arrow pfd.....	26	28	25
Pierce-Arrow pr. pfd.....	62 1/2	66 3/4	68
Reynolds Spring.....	20 3/4	18	16 1/2
Spicer Mfg.....	15 1/2	16 1/2	13 3/4
Spicer Mfg. pfd.....	88	88 1/2	87
Stewart-Warner.....	91 1/8	94	89
Stromberg Carburetor.....	79 1/2	80 3/4	78 5/8
Studebaker.....	106 1/2	105	101 3/8
Studebaker pfd.....	115	110	110 1/4
Timken Roller Bearing.....	39 1/4	40 3/4	39
U. S. Rubber.....	37 1/2	38 1/4	33 3/8
U. S. Rubber 1st pfd.....	89 1/2	86 1/2	82 1/2
White Motor.....	55 1/4	56 3/4	58 1/2
Willys-Overland.....	10 5/8	12 3/4	11 5/8
Willys-Overland pfd.....	82	84 1/4	85
Wright Aero.....	13	11 3/4	11 1/4

Detroit

	Dec. 31	Feb. 5	Mar. 4
Auto Body com.....	1 1/2	2	
Columbia Motors.....	11 1/16	15 1/16	
Continental Motors.....	6 7/8	7 1/2	7 1/4
Edmunds & Jones.....	42	40	
Edmunds & Jones pfd.....	93	93	
Federal Truck.....	21 1/2	21 1/2	
Ford of Canada.....	422	464	448
Hayes Mfg. com.....	1 5/8	2 1/2	2 1/2
Hoover Steel Ball.....	75	75	
Motor Products com.....	47	47	
Motor Products pfd.....	11	10 1/4	10
Motor Wheel.....	12 3/8	11 7/8	11 1/2
Packard com.....	92 1/2	93 1/2	91 1/2
Packard pfd.....	15 3/4	17	17 3/4
Paige.....	17 1/4	18 1/4	18
Reo.....	7	7 1/8	6 3/8
Timken-D Axle com.....	85	85	
Timken-D Axle pfd.....			

Chicago

	Dec. 31	Feb. 5	Mar. 4
Bassick Alemite.....	36	46 1/4	
Borg & Beck.....	29 3/4		
Chicago Coach pfd.....	88		
Continental Motors.....	6 3/4	7 5/8	7 1/8
Earl Motors.....	1 1/8		
Eaton Axle & Spring.....	24	23 1/4	
Gill Mfg. Co.....	18 3/4	17 1/4	17
Hayes Wheel.....	52 1/2		
Hupp.....	17 1/4	16 3/4	15 3/4

McCord.....	37 1/2		
Reo.....	17 1/4	18 1/4	
Reynolds Spring.....	18		
Stewart-Warner.....	91	95	89 1/4
Yellow Mfg. B.....	95	92	81

Philadelphia

	Dec. 31	Feb. 5	Mar. 4
Electric Storage Battery.....	61		

Cleveland

	Dec. 31	Feb. 5	Mar. 4
Firestone.....	68		70
Firestone 6% pfd.....	90		92 1/2
Firestone 7% pfd.....	88		89 1/4
Goodyear.....	8 3/4	10 3/4	10 3/4
Goodyear pfd.....	42		42
Jordan pfd.....	93 1/2		96 1/2
Miller Rubber.....	66		66
Miller Rubber pfd.....	96 1/2		96 1/2
Peerless Motors.....	23		22
Stearns, F. B.....	17 1/2		

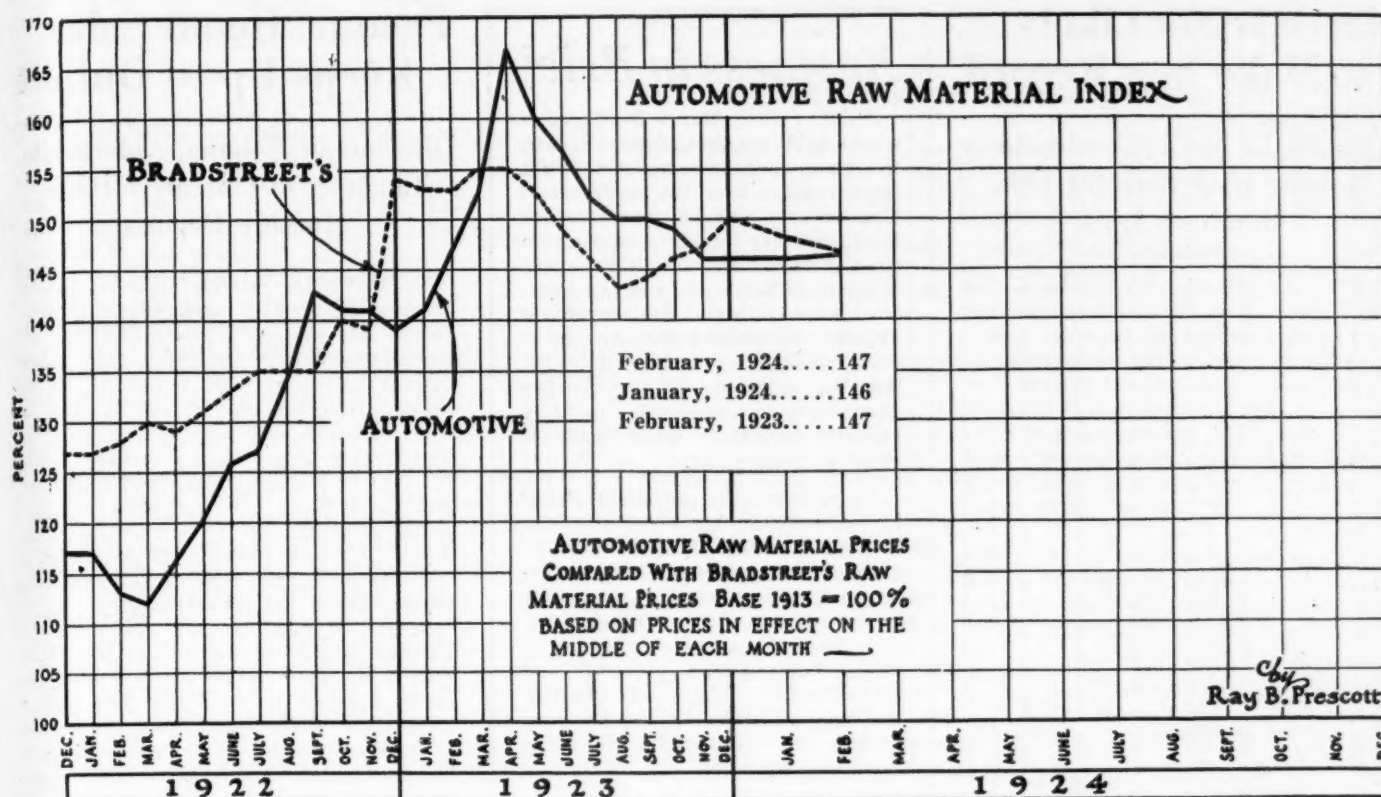
Boston

	Dec. 31	Feb. 5	Mar. 4
Gray & Davis.....	7 7/8	8	7
Greenfield Tap & Die.....	14 1/4		14 3/4
Hood Rubber.....	53	50 1/2	50 1/2
General Motors.....			14 3/4
Fisk Rubber.....			58 1/2

New York Curb

	Dec. 31	Feb. 5	Mar. 4
Cleveland Motors.....			20
Columbia Motors.....	50		
DuPont Motors.....			
Durant Motors.....	35	31 1/4	27 1/2
Durant Motors of Ind.....	10 1/2		8
Edmunds & Jones.....			40 1/2
Ford of Canada.....	464		452
Goodyear Tire & Rubber.....	9	10 7/8	10
Hudson pfd.....			17 1/2
Hupp.....	17		
Jordan Motor Car.....			31 1/4
Motor Products Corp.....	77		
Motor Products pfd.....			47 1/4
Paige Detroit.....	17 1/4		18
Peerless Motors.....	24		22 1/2
Reo Motors.....			18 1/4
Stutz.....	9 1/2	11 7/8	10 3/4
Timken-D Axle.....	6 1/2		6 3/4

MATERIAL COSTS SAME AS YEAR AGO



Trade Reports Good Prospects for Big Sales This Month

Salt Lake City

SALT LAKE CITY, March 4—The spring outlook for the automobile business in this section is better than it has been for years, in the opinion of most of the dealers and distributors. The great majority of the dealers appear to be well stocked with cars. Competition will be keener than ever, judging by the new agencies that have been opened up since last spring.

The increased business expected will be due to the continuous improvement of the public roads in the territory and the excellent industrial situation. Utah will have an important steel industry in the immediate future. The Columbia Steel Corp., founded just over a year ago with a capital of \$20,000,000 or more, will make pig iron at first, but there are many conservative people here who believe the next decade will see rolling mills turning out a great variety of steel products in the State. But regardless of this, the industry will bring immediate benefit through its huge payroll and purchasing power.

Kansas City

KANSAS CITY, MO., March 4—Motor car distributors and dealers of Kansas City and territory are all set for a big spring business.

Distributors have cars to deliver, and

a fair supply is available in the sales-rooms of the smaller-town dealers to meet the first calls of the buying movement in March and April. There has been no extremely heavy stocking of cars, but the trade will not be caught napping when the demand rises to spring peaks.

One of the disclosures of the post-show trade is the heavy demand for used cars. The call has been mounting steadily, until business can be described as brisk. The public's eagerness for new cars was partly expected, and is understandable; but evidently people suddenly took the notion that used cars were good values, too. There is actually a shortage appearing, it is said, in this class, in some districts.

The report of the Federal Reserve Bank of the Tenth District gives the clue to this free buying of automobiles, and foundation for the hopeful attitude of dealers. The review points out that agriculture is preparing for big production this year, influenced by excellent soil and moisture conditions and by improvement in the position of leading crops, notably corn, cotton, sugar beets, potatoes, truck and dairy products.

Much business has accumulated during bad weather while roads were almost impassable. The opening of spring is expected to bring a rush of business, both in deliveries of cars and in campaigning.

Chicago

CHICAGO, March 4—Passenger car distributors in the Chicago territory report February sales ranging from 33 1/3 to 125 per cent better than January and gains of 10 to 15 per cent as compared with a year ago; this despite the fact that February ordinarily is regarded as a poor sales month.

Many orders are now being booked for April 1 delivery, and leading distributors here predict a shortage in cars at that time as a result of the heavy spring demand, although present stocks are as a rule adequate. The predicted shortage applies more especially to the lower and medium priced cars, and distributors of the higher priced models are not regarding this phase of the situation with as much concern as the others. While the increase in sales which has been noted is more striking in the case of the lower priced cars, as is only natural, considerable improvement has been noted in those selling over \$2,000.

Improvement has been noted in the used car situation and dealers are moving their stocks with fair rapidity.

Automotive leaders here are looking forward to the best spring demand in their history.

Conditions in other cities on pages 594 and 595.

MAKERS SHOW CAUTION IN OPERATIONS

March Is Not Likely to Make New Record

Sales High, but Deliveries in a Measure Have Been for This Month or April

DETROIT, March 4—Schedules for March production show increases over the earlier months, but there is a tendency on the part of manufacturers to proceed slowly and for that reason it is not likely that the month will set new high marks. With the exception of some manufacturers in the medium price field the general schedules are considerably lower than earlier year estimates would indicate.

In every instance manufacturers are agreed that business is very good and that sales throughout the country have been high and are continuing high. There is not much secret, however, to the fact that in some sections selling has been for deliveries this month or in April and that in those instances dealer stocks are plentiful.

Deliveries of material and parts in the early part of February were held up in some instances by weather conditions, and some manufacturers report continued difficulty in getting deliveries, but in no case is this reported as serious. There are the usual day-to-day problems which all factories experience, but there is no general condition which might be held responsible for keeping production marks low.

Ford Planning 185,000

Ford schedules for March are for approximately 185,000 cars, which represents an increase of about 10,000 over February, but the schedule is still considerably below the high marks of last year. Chevrolet production in March will scale between 2600 to 3000 daily, which will give it an increased total over February, which is reported to exceed 50,000. The company was striving for 3000 daily by March 1, but this figure probably will not be reached until toward the end of the month.

Dodge Brothers is aiming to reach a schedule of 1000 daily by the end of the month, the present figure now being in excess of 900 daily. Buick is continuing at the 1000 or better daily rate. Hudson-Essex schedules are for 650 a day, and Studebaker will manufacture at approximately 700 daily. Each of these schedules represent a higher figure than had been reached at this time last year.

Maxwell schedules for March are for approximately 250 cars daily and it is hoped to bring Chrysler production to the 100 daily mark early in the month. Paige-Jewett schedules for March call

Business in Brief

NEW YORK, March 3—There is a noticeable slowness generally, but the past week has shown a slight improvement over its predecessor. Undoubtedly the adverse weather conditions are having a bearing on the situation. Business in the cities is reported better than in the country, where bad roads are preventing country merchants getting in to place orders for spring delivery. Another indication of the bearing roads have on business is shown by reports that mail order trade is showing good gains.

In industry, the optimism of the railroads in buying cars and locomotives is the bright spot, but, outside of that, considerable caution in ordering is noted in other branches of business. Steel is active and the output is reported heavy, but pig iron is quieter and scrap easier. The goods market has been unsettled by the break in cotton, which dropped eight cents from its high point.

Eastern lumber is firm and other building materials are moving in good volume. Construction trade is feeling the effects of bad weather as reflected in the slowing up of buying.

Food prices are lower, while the snow has helped crops in the Southwest, but the marketing of corn has slowed considerably. Storms have damaged winter wheat in the Middle West, north and south of the Ohio River, and in Tennessee and Kentucky.

Car loadings for the week ending Feb. 16 were 935,109, compared with 816,646 for the same week in 1923, and also are better than for the week of Feb. 9, this year, which had 906,489.

The market shows that stocks have recovered from their early loss, with bonds firm, money steady and foreign exchanges irregular.

for 7500 cars or approximately 300 daily, which will represent an increase over February of about 1900.

Hupp schedules for March are for 5000 cars or about 200 daily. Shipments in February approximated 3200. Oldsmobile is operating on a schedule of 400 daily and Oakland schedules are for approximately 300 daily, this mark being exceeded several days in February. Both of these plants will run considerably

(Continued on page 596)

Pace of Retail Sales Keeps Up to Output

Directors of National Automobile Chamber of Commerce Hear Monthly Reports

NEW YORK, March 5—Retail sales are keeping up with production, directors of the National Automobile Chamber of Commerce were informed at their monthly meeting here today. Reports showed that last month retail sales in New England and the Middle Atlantic States were larger than February, 1923, but that they were smaller in the Middle West and West. Bigger sales are expected during March, April and May this year than in the same period in 1923. Conditions in the Southwest, however, are relatively less satisfactory.

Stocks of new cars are the same to slightly larger in comparison with last year, while used car inventories are generally smaller in the East and larger in the Middle West and West.

Time payments, it is reported, are increasing, but this is attributed to increased sales volume. Deferred payments are more frequent on used cars than on new ones, but this is largely seasonal.

These trade reports are particularly favorable to the truck business, a steady improvement being shown. Sales of light commercial vehicles in New England, Pennsylvania and Ohio are much heavier than last year, while the market for heavy trucks is reported to be excellent in Illinois, Wisconsin, Ohio and Pennsylvania.

G. M. Sales in February Were More Than 80,000

NEW YORK, March 6—General Motors sales in February totaled more than 80,000, according to the corporation's announcement today. This compares with 60,959 in January and with 55,427 in February, 1923. The mark the General Motors units are aiming at this month is 71,669, made in March of last year. This report includes Buick, Cadillac, Chevrolet, Oakland, Oldsmobile and GMC truck, the figures being preliminary ones.

SPEEDWAY FILES SCHEDULE

KANSAS CITY, MO., March 1—The Kansas City Speedway Association has filed a schedule of net liabilities of \$617,249 and assets of \$526,740 in the Federal Court here in connection with a bankruptcy petition. The major portion of the liabilities was listed as notes given for money advanced, work performed and materials obtained.

Greater Cut in Tax Expected in Senate

**Congressman Clancy Predicts
That Full Levy on Parts Will
Be Removed There**

WASHINGTON, March 5—The first move in the fight in the Senate for the repeal of the excise taxes on automobiles and other general provisions in the administration's tax bill will be made tomorrow by the Senate Finance Committee, which holds its initial meeting. The bill itself will not be taken up, but the committee will confer with administration leaders as to the time when hearings will be begun. Indications are that this will be the last week in March and that the hearings will last for probably three weeks.

Just what the Senate holds in store for the automobile industry is, of course, problematical, but Representative R. H. Clancy of Michigan, who initiated the fight in the House which resulted in a \$25,000,000 reduction on automotive parts and light trucks when the bill passed the House last week, declared that it was his belief that this sum would be made even more in the Senate.

House Action Has Effect

"I have got an expression from twelve Senators, three of whom are those who have introduced bills in the Senate similar to those introduced in the House by me, and the work that automobile manufacturers, users, dealers and allied industries did in the House fight is having its effect now on the Senate.

"It would not be at all surprising to me to see the Senate Finance Committee recommend a reduction of the entire item of \$40,000,000 on parts and to leave the tax on trucks as it is today. This, in effect, would mean an increase of \$15,000,000 over and above the \$25,000,000 cut adopted by the House."

The entire case of the automobile industry's fight on the "nuisance tax" and other automobile taxes was summed up by Mr. Clancy in a six-page extension of remarks in the *Congressional Record*, and 2000 copies of this are being sent out by the Washington office of the National Automobile Chamber of Commerce.

Senators Get Copies

Additional copies are being sent to each member of the Senate, and copies are to be sent by the various automotive associations to its membership, with an appeal that there be no let-up in the fight until the Senate has actually passed the measure providing some relief for the automobile user.

Representatives of the industry conferred in New York this week in the headquarters of the National Automobile Chamber of Commerce and are marshaling their forces for a repetition of the drive made on the House, when the measure comes up before the Senate Finance Committee and on the floor of the Senate.

Importance of Trailers in Connection with Truck Operations Is Gaining Recognition

AN INTERVIEW WITH E. L. VOSLER,
Secretary and Sales Manager of the Fruehauf Trailer Co.,

By D. M. McDonald,
Detroit News Representative of the Class Journal Company

Detroit, March 4.

GOOD trailer business is no longer a question of road legislation, politics, or anything else, according to E. L. Vosler, secretary and sales manager of the Fruehauf Trailer Co., but is simply a matter of common sense application to transportation requirements of shippers.

The day has gone by when the truck manufacturer could hope to convince the shipper that in truck fleets alone lay the answer to his transportation requirements. So much so is this the fact, said Mr. Vosler, that every day trailer manufacturers are receiving fresh evidence that truck makers have come to recognize the true importance of the trailer in conjunction with truck operation and that it is in the happy medium of use of both that the greatest prosperity exists for the truck builder.

One of the largest truck companies in the country, he said, is analyzing the transportation requirements of its customers and prospective buyers and is frankly recommending the use of trailers in conjunction with trucks for greater economy in their operation. This applies both to use in short haul in cities and longer hauls between cities, he declared, in both of which the trailer affords opportunities for large economies according to the shipping requirements of the user.

This particular truck company, he said, has long since ceased to sell trucks simply as vehicles but is selling them solely as a unit of transportation, and trucks sold this way must be sold with a view to their use with trailers. As truck companies depart from consideration of the truck simply as a vehicle and enter into its sale from the transportation viewpoint they are bound to serve the needs of buyers in a much larger degree and consequently are bound to enjoy greater success.

Trailer and truck businesses are bound hand and foot, said Mr. Vosler, and it is impossible to separate them. For a time the trailer was handicapped because it had not been developed to the point where its use in traffic was satisfactory, but these earlier faults have been eliminated and the usual trailer today can be operated as expeditiously in city traffic as over country roads. It would seem that the semi-trailer with tractor, however, is the better vehicle for city operation and the four-wheel for inter-city work.

Standardization in the trailer field will perhaps never come, because essentially the trailer has to be built to meet individual requirements of owners, these being governed not only by the class of commodity to be transported, but also by the shipping facilities at either end of haul. It is far more practical to standardize on the truck, tractor or operating unit, and fit the carrying unit according to the needs of the transportation.

Manufacturers of trailers are looking for much better business in this present year than in any since the war. This is due not only to the fact that the general business of the country is good, and there is a large volume of transportation to be handled, but also to the changing attitude toward trailers. Each year has seen an increase in trailer use, according to the general business condition of the country, and as their efficiency is becoming more generally known is every reason to expect that this present year will be a better one than any that has gone before.

Arrangements are now being made, Mr. Clancy states, for representatives from all of the automotive trade associations, the A. A. A. and other organizations to testify before the Senate Finance Committee on the automobile excise tax repeal. Mr. Clancy himself will testify. Based on his personal canvass of twelve Senators, Mr. Clancy declares that the Senate is decidedly more sympathetic with the cause of the automobile industry than the House.

One of the factors, just coming into the horizon, which may mitigate against more liberal cuts for the automobile industry is the bill for \$330,000,000 for Federal-aid highways, hearings on which begin on March 10. Much of the argument against any large cut in automobile taxes, before the House Ways and Means Committee, was that the automobile is

the chief user of roads and should, therefore, be made to bear the chief burden of its construction.

"Were it not for this factor," Clancy declared, "I feel confident that the repeal of the parts and accessories taxes as well as the entire tax on trucks would be removed without question by the Senate."

SELECT SHOW DATES

NEW YORK, March 6—Members of the National Automobile Chamber of Commerce, at their quarterly meeting here today, voted on national show dates for 1925, selecting Jan. 3-10 for New York and Jan. 24-31 for Chicago. After considerable discussion as to the location of the New York show, it was decided to use the Bronx Armory again.

\$13,034,032 Netted by Willys-Overland

Report Shows Ratio of Current
Assets to Current Liabil-
ities of 5.4 to 1

TOLEDO, March 3—The most profitable year in the history of the Willys-Overland Co. is recorded in the annual report of 1923 operations, which shows net profits of \$13,034,032. Current assets are \$37,468,977, offsetting current liabilities of \$6,916,572, a ratio of 5.4 to 1. This compares with current assets of \$27,242,211, as against current liabilities of \$3,741,867 at the end of 1922.

These profits were made up of \$2,729,468 in the first quarter, \$5,202,916 in the second, \$3,780,745 in the third and \$1,320,900 in the fourth. The sales for the year totaled 196,038 cars, of which 146,632 were Overlands and 49,406 Willys-Knights, the sales running 28,168 Overlands and 10,862 Knights in the first quarter, 48,285 Overlands and 16,382 Knights in the second, 37,689 Overlands and 12,850 Knights in the third and 32,490 Overlands and 9312 Knights in the fourth.

Sales were 50,000 cars in excess of the best previous record, with Willys-Knights sales increasing 238 per cent over the preceding year.

Has No Bank Indebtedness

President John N. Willys points out in his annual statement that the company shows no bank indebtedness. The first mortgage 7 per cent gold notes, maturing Dec. 1, 1923, amounting to \$17,357,500, were entirely paid off in July, 1923. A new issue of ten-year 6½ per cent sinking fund gold bonds were issued Sept. 1, 1923, totaling \$10,000,000.

During the year the par value of the common stock was changed from \$25 to \$5 per share, thus wiping out a book deficit and leaving a surplus of \$13,002,417, enabling the company to be in a position, if earnings warrant, to consider the resumption of dividends at an earlier date than would have been possible under the old par.

The consolidated balance sheet shows current assets and current liabilities as follows:

Current Assets	
Cash	\$ 582,095
Notes Receivable	1,344,050
Accounts Receivable	2,307,122
Total	3,651,173
Less Allowance for Doubtful	170,145
	3,481,027
Merchandise Inventories	33,399,854
Grand Total	\$37,468,977
Current Liabilities	
Accounts Payable:	
For Purchases, Expenses, etc.	\$4,549,238
Dealers' Performance Bonus	514,106
Excise Taxes	335,627
Unpaid Pay-Roll	273,744
Refund Certificates	228,830
Dealers' Initial Payments	120,903

FORD GIVES MUSEUM TO PLANTIFF'S TOWN

BELCHERTOWN, MASS., March 5—The new building erected for the Belchertown Historical Association by Henry Ford for a museum to show the history of vehicles has been finished and will be dedicated soon.

Mr. Ford became interested in Belchertown through the fact that it was the birthplace of his Eastern manager, Gaston Plantiff, who left here to engage in the bicycle industry at Waltham as the stepping stone to his career in the automobile industry.

The association had a stone building that Mr. Ford liked, and as the idea of a museum of vehicles had appealed to him for some time, he decided to make this typical rural town the site and to have a special building erected for the purpose.

Stock Purchase Contract and Interest	185,114
Price Adjustments	42,619
Total	6,250,183
Accrued Taxes, Interest, etc.	666,388
Grand Total	\$ 6,916,572

H. F. Harper Reelected Motor Wheel President

DETROIT, March 3—Officers of the Motor Wheel Corp. have been reelected following the regular stockholders' meeting last week. The official staff is headed by Harry F. Harper as president and general manager; Drury L. Porter, first vice-president; W. C. Brock, manager of the company's Southern interests, second vice-president; B. S. Grier, third vice-president and treasurer, and Clarence C. Carlton, secretary. B. J. Adams has been made assistant secretary and E. H. Wildt assistant treasurer.

The company is said to be making heavy demands on its Southern mills and plants and is in the market for large quantities of steel. The balloon tire type of wheel is reported to have made large increases in the company's replacement business.

Business of Seiberling Approximated \$6,000,000

AKRON, March 4—Seiberling Rubber Co. during the year just closed did approximately \$6,000,000 worth of business, according to President Frank A. Seiberling, as compared with 1922 sales of \$3,845,779.

Profits on the year's business, however, were small, according to Mr. Seiberling, because of the reduced tire prices and the higher material costs during the year. In 1922, the first year of the company's operations, net profits amounted to approximately \$58,000.

Stinnes Gets Doehler Rights for Germany

Arrangements Made Similar to
Those Covering Other Coun-
tries in Europe

NEW YORK, March 4—The Doehler Die Casting Co. of New York has sold to Hugo Stinnes, the German financier and industrialist, the rights for the use of the Doehler process of die-casting brass and aluminum in Germany. These two patents are those under which the Doehler company itself manufactures die-castings in this country and the deal is similar to that made by President H. H. Doehler with other companies in England, France, Switzerland and Italy which are operating under Doehler patents at this time.

It was at first reported that the Stinnes interests, in making this purchase, had secured control of the sale in Europe of the Doehler products and that the contract gave them the further right to sublet these rights in South America. This is denied by Mr. Doehler, who states that the arrangement with Stinnes involves only Germany, where Mr. Stinnes will operate through Hirsch, Kupfer & Messingwerke.

That the General Motors Corp. is interested in this transaction is denied. General Motors is a stockholder in the Doehler Die Casting Co., holding 40 per cent of the stock, consisting of 4000 shares each of preferred and common, but it is said that it did not figure in these negotiations.

At the same time the Stinnes sale was announced the Doehler company changed its capitalization from 10,000 shares of \$50 par common stock to 150,000 shares of no par value, a step taken to secure wider distribution of its stock and at the same time secure a listing on the New York Stock Exchange.

Oakland to Get Factory in Saginaw for Engines

PONTIAC, MICH., March 4—Plans are being made by the Oakland Motor Car Co. to take over the engine plant of the Saginaw Products Co. at Saginaw for the production of parts of engines in case the Oakland engine plant here cannot supply all needed for the present heavy production schedule. It is not the intention of the Oakland company to manufacture cars at the Saginaw plant.

This proposed action has been brought about by the record-breaking production of Oakland cars so far this year, the February sales reported having broken all previous sales records for a single month. Sales for February exceeded the previous record month, June, 1919, by more than 1000 cars. The figures show a 300 per cent increase over February, 1923, and are more than 59 per cent greater than February, 1919, which was the previous record February for sales.

Studebaker Reports \$18,342,222 Profit

Net Earnings of Corporation Last
Year Are 1.4 Per Cent In-
crease Over 1922

SOUTH BEND, IND., March 3—Studebaker Corp. net profits in 1923 amounted to \$18,342,222, an increase of 1.4 per cent over the preceding year as a result of business that totaled \$166,153,683 in net sales, an increase of 24.8 per cent over 1922. This is the story told by the thirteenth annual report of the corporation sent to its 8747 stockholders.

Manufacturing cost of the 150,192 cars produced, of which 145,167 were sold, including reserve for depreciation, selling and general expense, totaled \$145,845,878, leaving net earnings \$20,914,740, an increase of 1.2 per cent over 1922.

Deduction of \$2,572,518 for taxes reduced the net profits to \$18,342,222. Cash dividends were paid on the preferred (7 per cent) and common stock (10 per cent) to the amount of \$8,138,750, and the balance of \$10,203,472 credited to surplus account.

Profit Per Car Declines

Net profits were at the rate of 11 per cent each dollar of sales, as compared with 13.6 per cent the preceding year, and 23.6 per cent on \$75,000,000 outstanding common stock, as against 29 per cent on \$60,000,000 in 1922.

President A. R. Erskine, in his report points out that, while the profits of the last half of 1923 were smaller than those of the first, the total for the year was quite large. He ascribes the decrease in profits the last half to the flare-up in prices last spring and summer, which increased the cost of materials and supplies used in the third and fourth quarters by 10 per cent, while cost of production was further increased by curtailment of production in the last quarter.

Additionally, the fourth quarter absorbed charges for inventory adjustments, certain rebates to dealers and miscellaneous reserves which reduced the net profits thereof from \$1,863,487 to \$115,968. A substantial amount of these charges related to the business of the third quarter and part of the second.

No Bank Loans Required

Last year's operations were financed without bank loans. Manufacturing inventories in all plants were turned over better than nine times, figuring sales on a manufactured cost basis. Gross expenditures amounting to \$10,696,413 were made for plant and property expansions and betterments; preferred stock to the amount of \$850,000 par value was purchased and retired; dividends amounting to \$8,138,750 were paid, and current liabilities, reduced \$1,198,053.

Mr. Erskine says the corporation looks forward to a big spring business with normal profits. Manufacturing sched-

ules will be adjusted from time to time as demand warrants, he says, and adds that unfilled orders now in the hands of the retail branches and dealers are as numerous as they were at this time last year.

The corporation's consolidated income account is as follows:

	1923	1922
Net sales.....	\$166,153,683	\$133,178,881
Expense, depreciation, etc.	145,845,879	113,134,924
Net earnings	\$20,307,804	\$20,043,957
Other income.....	606,936	615,135
Total income ...	\$20,914,740	\$20,659,092
Federal taxes	2,572,518	2,572,897
Net profits	\$18,342,222	\$18,086,195
Preferred dividends ..	638,750	673,750
Common dividends ..	7,500,000	6,000,000
Surplus	\$10,203,472	\$11,412,445
P. & L surplus	19,673,733	*10,237,189

*After provision for \$15,000,000 stock dividend and transfer of \$405,000 to special surplus account.

The consolidated balance sheet:

ASSETS		
	1923	1922
Plant	\$52,472,637	\$43,426,182
Good will, patents, etc.	19,807,277	19,807,277
Citizens Homes Co...	1,523,832	1,559,928
Cash	9,955,791	15,174,396
Investments	2,857,217	4,017,991
Accts. & notes receivable	6,917,226	4,859,578
Sight drafts outstdg..	1,685,947	3,509,865
Inventories	26,674,925	21,514,249
Deferred charges	529,428	761,323
LIABILITIES		
Preferred Stock	\$ 8,600,000	\$ 9,450,000
Common stock	75,000,000	75,000,000
Deposits on sales contracts	366,075	392,454
Accounts payable	5,567,419	6,756,635
Federal tax reserve, etc.	2,584,386	2,690,464
Sundry creditors	5,772,667	5,649,046
Special surplus	4,860,000	4,455,000
Surplus	19,673,733	10,237,190

Financing Is Arranged for Apperson's Output

INDIANAPOLIS, March 1—Announcement was made at Kokomo this week by Don C. McCord, who, with Maurice L. Rothschild, acquired control of Apperson almost a year ago, that arrangements to finance this year's production had been completed.

Mr. McCord arrived from New York to assume active charge of the production and management of the company. It is claimed that the production budget outlined at a creditors' meeting last fall will be increased. At that time the minimum number of cars to be produced during the current year was set at about 700.

N. H. Van Sicklen, vice-president and general manager, and Edgar Apperson, chief engineer, have been in Western territory looking after company organization work and reports from their work and from other territory investigation in the East by Mr. McCord are said to indicate that the company has good prospects for business this year.

More Resignations Announced by Dodge

C. W. Matheson Retires as Sales
Executive and A. E. Houghton
from District Work

DETROIT, March 1—The resignation of C. W. Matheson as vice-president in charge of sales of Dodge Brothers became effective today. Announcement of the resignation, together with those of A. E. Houghton, director of districts, and of H. M. Robins, director of foreign sales, was made by F. J. Haynes, president and general manager.

No additional information was advanced by the company with regard to the resignations, and it was declared that successors probably will not be announced previously to March 10, at which time executives who are now on the Pacific Coast attending the San Francisco show will have returned.

Mr. Matheson states that he has no plans for his future participation in the industry to announce at this time, but that he expects to speak of these within a short time. He is leaving for a two weeks' vacation trip to Florida at once and will return to Detroit to complete his plans for future activities.

The situation at Dodge Brothers giving rise to the resignations of these officials is ascribed as being due to a difference of opinion over manufacturing policies. The retiring executives declare that they are leaving the company with entire friendliness and with the good will of all their associates.

Mr. Matheson has been connected with the Dodge Brothers organization since 1914, when he became New York district representative. He was brought into the plant in 1916 to become director of service, and in 1920 he became general sales manager, succeeding A. I. Philip. In 1922 he was named vice-president in charge of sales, in which position he continued to the time of his retirement.

Appeals Court Sustains Claim to Bumper Patent

CINCINNATI, March 3—The Court of Appeals has sustained the decision of Judge Westenhaver of the Federal Court at Cleveland in the suit brought against the Cox Brass Manufacturing Co. in August, 1921, by the American Chain Co. involving the Pancoast and Grotenhuis bumper patent No. 1,374,893.

Judge Westenhaver handed down a decision on May 26, 1922, holding that claims six to eleven of the patent, the claims involved in the suit, were invalid, and dismissed the American Chain Co.'s bill of complaint. The latter company then appealed to the Court of Appeals, which has sustained Judge Westenhaver.

The Eaton Axle & Spring Co., which acquired the bumper business of the Cox Brass Manufacturing Co. in 1923, defended the case in the Circuit Court of Appeals.

Dodge Building Cars at Plant in Canada

Aims to Turn Out All Canadian Built Product for Britain and Colonies

DETROIT, March 4—First cars are now being turned out by Dodge Brothers in the new manufacturing plant at Walkerville, Ont., which during the present year is expected to reach a scale of production large enough to meet the requirements of the Canadian market and of all export shipments to Great Britain and British possessions other than Australia.

Under the new manufacturing program the company will be in a position to sell its cars in Canada at a lower price than has formerly been the case, due to tariff considerations. With the additional advantage of presenting to the home market a Canadian-built product, it looks for a greatly increased business, not only in Canada but in all British colonies.

Canadian Operating Company

The Canadian business will be in the hands of Dodge Brothers, Co., Ltd., a Canadian operating company, the personnel of which is made up for the most part of Dodge Brothers executives. This company was formed several years ago, when Canadian operations were first contemplated, but with the exception of partial assembly, which has been carried out on the Canadian side of the Detroit River, the company has deferred the real start of its Canadian operations till now.

Work of equipping the Walkerville plant has now been completed, and shipments are being made. One of the first shipments was of sample cars destined for England. In the new plant the car is completely manufactured, Canadian material being used entirely, according to the ability of the Canadian market to supply it, the principal units and other material being shipped from the main plant here.

Completely Contained Unit

With the further development of the market the company plans to do more of its manufacturing for the Canadian trade in Walkerville, so that it will be a completely contained unit. The present expansion operations represent a step in this direction. As an indication of its plan to meet market requirements, the Canadian plant will furnish its cars in optional colors, special equipment for which has been installed.

A statement by Dodge Brothers declares that the Canadian company will operate its own departments and formulate its own policy in keeping with the policies and requirements of the countries to which its product is directed. Sales service and manufacturing will be handled directly from its own offices, making necessary the employment of many skilled Canadian workers.

ACTUAL FACTS URGED IN ACCIDENT REPORTS

WASHINGTON, March 4—Following a conference with members of the National Press Club, the American Automobile Association has decided to follow the example of the National Automobile Chamber of Commerce in asking the newspapers to cooperate in reducing the number of automobile accidents.

It is proposed to do this by asking members of affiliated clubs to follow up accidents in their respective localities and see that the local newspapers get the actual facts as to how each accident occurs rather than simply the sensational features.

By eliminating tariff considerations the company will be in a position to offer its cars on the Canadian market in the same relative price class that they occupy in the United States. Up to this time the Dodge Brothers car in Canada has sold at higher prices than on several lines which are higher in the United States. This in itself presented a severe handicap, the company declares, so that whatever progress has been made has been solely on the merits of the car.

Shipping to England and British possessions will be by way of Montreal. Australian and other export shipment will continue to be made from the main plant here.

Ward La France Becomes Head of Truck Company

ELMIRA, N. Y., March 3—Ward La France Truck Corp. has been reorganized, Ward La France, formerly connected with the La France Truck Corp., becoming president, and Joseph G. Grossman, president of the Fayette Motors Corp., the metropolitan distributor, being elected secretary and treasurer.

The company will continue the manufacture and sale of the Ward La France trucks in three models—2B, 2½ to 3½-ton; 4A, 3½ to 5-ton; and 5A, 5 to 7-ton. Prices have not been announced.

The new owners have purchased a building at 139th Street and Southern Boulevard, New York City, containing 22,000 square feet of floor space, which will be used for sales and service and which will be New York headquarters of the company. This building will be occupied March 20.

NOVO ENGINE ELECTION

DETROIT, March 4—Novo Engine Co. directors have been reelected as follows: R. H. Scott, C. E. Bement, Harry C. Teel, D. E. Bates, E. T. Teel, E. J. Bement and D. R. Hoadley. The company's business for the past year showed important increases, with export business coming steadily to the fore.

Duplex to Pay Off Bank Indebtedness

Will Start Production in New Plant at Lansing Without Need for Refinancing

DETROIT, March 5—Duplex Truck Co. will start manufacturing in its new plant at Lansing without the necessity for refinancing, said Joseph Gerson, president, at the annual meeting of the company. Sale of its former plant to Reo Motor Car Co. for \$200,000 will enable Duplex to pay off its bank indebtedness of \$169,199, he said.

The company has a cash balance of \$30,000 and lists in its assets \$85,759 notes receivable and \$89,504.30 accounts receivable. There is also an inventory of \$240,569 taken at market valuations.

Beside the bank indebtedness the company owes \$13,779 in accounts payable and other items of accrued taxes and payrolls approximating \$2,500. The company will therefore be in position to resume manufacturing without additional capital, Mr. Gerson said, as soon as its new building is ready.

Orders for thirty trucks were turned in by Harry M. Lee, former president and general manager who is now in charge of sales. Mr. Lee obtained these orders on a recent two months' trip through the East. Other business is promised in other quarters, and Mr. Gerson, and altogether the prospects for the company are very good.

The old board of directors with the exception of Harry J. Sproat, who resigned, were reelected, the vacancy being filled by the election of A. C. Pratt.

Puritan Machine Asks That It Be Dissolved

DETROIT, March 5—Directors of Puritan Machine Co., which has specialized in the servicing of orphan and obsolete cars, have filed a petition for the dissolution of the company and creditors have been ordered to show cause in Circuit Court April 15, why a dissolution should not be granted. The directors are Alfred O. Dunk, his wife, Edith W. Dunk, and Oscar R. Taylor.

The service business of the company will be taken over by the Puritan Auto Parts Co., the officers of which are A. O. Dunk, president; H. G. Gremel, secretary and treasurer, and L. E. Craig, vice-president. About 125 makes of cars which have passed into oblivion were being serviced by the company, some of the applications for service being on cars twenty years old. Service parts on practically all of these are carried in stock.

Dissolution of Puritan Machine Co. is asked on the grounds that failing health compels Mr. Dunk to discontinue his active direction of the company. It is also set forth that additional funds are required and they are not available.

Car Stocks Reduced by Current Demand

In Some Quarters Fear Is Expressed That There Will Be a Shortage in Spring

NEW YORK, March 3.—Further advances in manufacturing schedules indicate an increasing demand for automobiles. On the eve of what is expected to be an exceptionally active spring selling season, producers are bending all efforts toward preventing a shortage of cars. Attention has been directed to gathering surplus stocks either in dealers' hands or in locations where they would be easily accessible to retailers.

Heavy current demand, however, has prevented the accumulation of as large stocks as it is felt will be needed to meet the rush of buying, with the result that in some quarters there still continues the feeling that the spring demand will run in excess of the supply and that conditions similar to those experienced a year ago will be felt this year.

Sustained buying interest on the part of the public is in evidence at shows held at leading distributing points. Attendance is far better than at last year's shows and sales from the floor are greater. It is this interest that is one of the dominant factors in guiding manufacturers.

Satisfactory Truck Conditions

Truck producing centers report satisfactory conditions, with encouragement given through the prospects of the final passage of the excise tax bill repealing the levy on lighter duty vehicles. This relief will widen the sales field to a notable extent. Curtailment of other taxes will affect allied branches of the industry. Truck schedules are following a normal increase and output for last month likely will exceed the 28,797 reported in January, despite the fewer working days in February.

January output of trucks was well ahead of a year ago and more than tripled production in the same month of 1922. It exceeded both December and November of last year and closely approached October. Substantial gains this quarter are expected over the final quarter of 1923, when 85,956 trucks were produced. Farmers are entering the field in slightly increased number. Commercial centers continue to be good buyers. Bus demand is growing and truck makers are actively engaged in meeting it.

Business is excellent with parts

FIRST ROSARIO SHOW IS DATED FOR APRIL

BUENOS AIRES, ARGENTINA, Feb. 5 (By Mail)—In conjunction with the exposition of provincial industries held by the Sociedad Rural of Rosario, the first automobile show in the important city of Rosario, capital of the province of Santa Fe, will be held in April.

The Automovil Club of Argentina has reserved space for the automobile exhibits and the announcement is made here that many distributors have decided to exhibit their lines. Considering the various products of the district, the exposition promises a successful outcome and a large attendance is expected. It will open on April 6 and close on April 27.

makers. January sales mounted well above December, members of the Motor and Accessory Manufacturers Association reporting a 17.87 per cent increase, with past due accounts decreasing 39.23 per cent and notes outstanding showing a drop of 14.82 per cent.

Parts making plants are operating on capacity schedules as are most of the major automobile manufacturing factories. Better delivery of material this month is expected to enable Ford to reach higher output totals than during either last month or the month previous. March doubtless will see the entire industry going along on a level comparable with the best months of last year.

Pulcher Chosen to Head Federal Motor Truck Co.

DETROIT, March 4—M. L. Pulcher, who has been vice-president and general manager of the Federal Motor Truck Co. since its organization fourteen years ago, was elected president and general manager at the annual meeting, succeeding T. E. Reeder, who becomes chairman of the board.

Other changes in the personnel are the elevation of H. J. Warner, formerly vice-president in charge of production, to first vice-president, and the naming of Hal H. Smith, a director, as vice-president. R. W. Ruddon, who has been assistant secretary, has been made also assistant general manager.

ELECTRIC TRUCK EXHIBIT

NEW YORK, March 4—In connection with the convention of the National Electric Light Association at Atlantic City in May, there will be held a joint exhibit of electric trucks in which the Electric Transportation Bureau of the N. E. L. A. and the Society for Electrical Development will cooperate.

Would Ship to Cuba Without Boxing Cars

Such a Plan Is Being Considered by Ward Line—Big Saving Seen as Result

NEW YORK, March 3—A plan by which automobiles for export to Cuba could be shipped without boxing, thus saving the cost of the boxing and reducing the bulk freight accordingly, is being studied by the Ward line in connection with the possible reconditioning of two of its vessels sailing between this port and Cuba. This was stated today by H. Warner, assistant general freight agent, who said that he is now in communication with the export managers of several automobile companies and that a careful analysis is being made of the project.

It is proposed to make some alterations on one of the decks of the two liners so that automobiles could be driven on board at New York and driven off at Havana. The space allotted to automobiles, according to the plan, would accommodate from 75 to 100 medium sized vehicles and this space would be so arranged as to prevent possible damage from rolling or heaving of the ship. Being between decks, the space would be so inclosed, Mr. Warner declared, that the finish and parts of the cars would not be affected by salt air or weather.

With the growth of the automotive export business, the automobile freight is becoming increasingly important to the steamship companies, but thus far little effort has been made by any lines to provide particular facilities for automobile shipments. The cost of boxing ranges upward from \$40 to \$50 to more than \$100 and this saving, plus any freight reduction, would be significant in reducing the landed cost of the car to the overseas dealer. If the Ward line can work out such a method of handling overseas shipments, it might be applied by other companies with the result that large amounts would be saved annually on the ocean freight bill of the industry.

The volume of automobile shipments to Havana is increasing, it is stated, although a large part of such shipments from the factories is made via Key West, with the automobiles being shipped in freight cars without boxing. The freight cars are ferried across to Havana, where the automobiles are unloaded.

CORRECTION

The statement in AUTOMOTIVE INDUSTRIES of Feb. 28 on Firestone's policies in respect to balloon tire manufacture was in error in stating that the 5.25/21 in. size is not one of those approved by the Rubber Association. This size, which is one of the four "unit changeover" sizes made by Firestone, is included in the twenty-three balloon sizes approved by the Rubber Association.

Employer Entitled to Shop Inventions

So the United States Supreme Court Holds in Deciding
Eaton Axle Suit

CLEVELAND, March 3—Title to Patent No. 1,249,473, issued to William J. Peck Dec. 11, 1917, relating to a rotary spring-forming and quenching machine, has been acquired by the Eaton Axle & Spring Co. of Cleveland, it is announced, through a decision of the United States Supreme Court on Feb. 18, in favor of the Standard Parts Co.

The case was that of the Standard Parts Co. against William J. Peck, the Eaton company having acquired the interest of Standard Parts in connection with its purchase of the Perfection and Pontiac spring plants from the receiver of Standard Parts last spring. In this decision, the Supreme Court reversed the decree of the Circuit Court of Appeals. Mr. Peck now will have to assign his patent to the Eaton company, it is said, as the successor to the interest of Standard Parts.

Outside of the value of the patent to the Eaton company, it is pointed out that the Supreme Court decision settles a point that has been in dispute for years as to the rights of an employer to the invention of an employee who has been hired for the specific purpose of making inventions for the employer.

View of Supreme Court

The Supreme Court holds in favor of the employer, declaring as follows:

By the contract Peck engaged to "devote his time to the development of a process and machinery" and was to receive therefor a stated compensation. Whose property was the "process and machinery" to be when developed?

The answer would seem to be inevitable and resistless—for him who engaged the services and paid for them, they being his inducement and compensation, they being not for temporary but perpetual use, a provision for business, a facility in it and an asset of it, therefore contributing to it whether retained or sold—the vendee (in this case the Standard company) paying for it and getting the rights the vendor (in this case the Eaton company) had.

Evidence showed that Peck had designed the machine in 1915, while in the employ of the Hess-Pontiac Spring & Axle Co., a concern that later was acquired by Standard Parts. Mr. Peck filed an application for patent under his own name, and in 1920 sued the Standard Parts Co. for infringement, claiming that the Hess-Pontiac company did not acquire, under contract, any interest in the patent, but merely a shop-right which was personal and not transferable to the Standard Parts Co.

BRITISH EAST AFRICA TARIFF

WASHINGTON, March 3—A reduction of 10 per cent ad valorem in duties on motorcycles and motor accessories im-

ported into Kenya, Uganda and Tanganyika Territory became effective Jan. 1, 1924, according to information received by the United States Department of Commerce. Motorcycles and motor accessories formerly were assessed at 30 per cent ad valorem, but under the new schedule are assessed 20 per cent.

The duties on motor cars and chassis, formerly 30 per cent ad valorem, under the new schedule will be £15 plus 5 per cent ad valorem.

Harvard Bureau Begins Work on A. E. A. Survey

BOSTON, March 3—The survey on cost of doing business in the wholesale automotive equipment trade, conducted by the Harvard Bureau of Business Research for the Automotive Equipment Association has been begun. Forms have been sent to a list of representative jobbers, asking for detailed facts about their business. The forms are not long, but will provide a wealth of vital information for everyone connected with the parts and accessory business.

The wholesaler is asked, in addition to filling in a profit and loss statement, to tell specifically the lines of merchandise he handles; whether or not he operates a garage, service station or taxicab service; net inventories at the beginning of the year; amounts paid in salaries and wages; proportion of sales made at retail and wholesale; number of traveling salesmen employed; makes and sizes of tires and tubes carried, and to answer a number of other questions of a similar character.

Each wholesaler submitting a report of his business will receive a summary of the results of the investigations, but the details will be held confidential.

Better Roads Increase Dominican Use of Cars

SANTO DOMINGO, DOMINICAN REPUBLIC, Feb. 13 (by mail)—The increasing use of automobiles in this territory is accompanying the improvement of Dominican highways, of which more than 600 kilometers already have been surfaced and are opened to motor traffic. This total is given in governmental report just made, stating:

To date (January, 1924) there have been constructed 250 kilometers of macadam highway and 350 kilometers of gravel surfaced highway. Almost all of the metaling is five meters wide and the grades do not exceed six per cent.

By April 1, 1924, there will have been constructed 120 kilometers of additional highway of the same character. At least 100 kilometers more will be completed during 1924 and it is the intention to continue construction during 1925.

All highway construction and maintenance is being done by the National Department of Public Works with funds provided by loans made to the National Government by United States bankers and by funds obtained from internal and import revenues. A very small amount of money received from a local road tax has been expended on third-class roads.

Employment Reaches High Mark with Ford

Company Has 157,000 on Payroll
in U. S.—68,500 Work at
Highland Park

DETROIT, March 4—Of the 157,000 workers employed in Ford industries in the United States, more than 24,000 are employed in branch assembly plants, according to an announcement made by the Ford Motor Co. It is also stated that employment now is at the highest point in the company's history.

The largest number employed in any single manufacturing unit is at the Highland Park plant here, where 68,500 men are at work. The biggest increase in employment at any one place during the past year was at the River Rouge plant, where there are nearly 42,000, as compared with 28,000 a year ago.

Employment in Other Plants

Other manufacturing units, including the Lincoln car plant in Detroit and the plants at Kearny, N. J.; Hamilton, Ohio; Green Island, N. Y.; Glassmere, Pa., and Poughkeepsie, N. Y., employ nearly 11,000 men. Smaller plants around Detroit give employment to more than 800, while at present there are more than 4000 men at work on the company's timber and iron ore properties in the upper peninsula of Michigan.

Ford coal mines in Kentucky and West Virginia are giving employment to more than 3500 men, and the Detroit, Toledo & Ironton, the Ford railroad, employs in excess of 2500. There are, in addition to all these, some 700 employees in the Henry Ford hospital at Detroit, more than 700 in the Henry Ford Trade School at Highland Park and upward of 11,000 employees in the foreign branches of the company.

Many Freight Cars Used

The Ford company also reports that more than half a million freight cars, one-fifth of the freight car ownership in the country, are used annually by the Ford Motor Co.'s main plants and various branches. The average freight charges paid through the Detroit offices direct to railroads, those paid by branches on minor shipments, and freight charges on direct shipments made from manufacturing institutions to branches approximate \$78,200,000 annually. Adding to this about \$75,000,000 paid by dealers on shipments of automobiles received by them brings a conservative figure of \$150,000,000 paid every year in freight charges through Ford.

Shipping space economies, effected through the company's methods, are seen in the fact that while parts shipments to the assembly branch plants are figured at ten units for each freight car, in rail shipments of completed cars from the branches to the dealers only six assembled Ford cars and trucks can be loaded into a standard thirty-six foot box car.

Canada Experiments With New Rail Coach

Is Driven by 225 H.P. Gasoline
Engine—New Haven Rail-
road Adds Units

NEW YORK, March 1—Satisfied with the results obtained through the operation of motor rail coaches which it put into service two years ago, the New York, New Haven & Hartford Railroad has ordered ten new units, each of which will accommodate sixty passengers and carry 200 pounds of baggage and powered with a 120-hp. six-cylinder engine.

Upon delivery these units will be placed in service, operating between Plymouth and Middleboro; State Line, Great Barrington and Pittsfield; Framingham, Marlboro and Mansfield; New Bedford, Mansfield and Taunton; Providence and Hopewell; Fullerton and Poughkeepsie; Franklin and Valley Falls; Wickford Landing and Wickford Junction; Ridgeville and Branchville and between Suffield and Windsor Locks.

It also is reported to the National Automobile Chamber of Commerce that the Canadian National Railroad is experimenting with a high-powered motor coach which is driven by a 225-hp. gasoline engine and which seats fifty-five passengers. There is a baggage compartment 15 ft. 2 in. long and the coach has a steel body differing from most rail motor coaches, which generally have bodies built on a standard motor bus style. The car weighs between 40,000 and 45,000 lb.

The N. A. C. C. reports that whereas there were only forty railroads operating motor rail coaches in 1922, there were 157 using them the first of the year.

Exhibitors' Hall Chosen for Service Exposition

NEW YORK, March 4—Exhibitors' Hall in the General Motors Building, Detroit, has been secured for the exposition by service equipment manufacturers of service station tools and equipment, which is to be held in conjunction with the National Automotive Service Convention, fostered by the National Automobile Chamber of Commerce and scheduled for May 19 to 22.

It has been discovered that this hall has room for only 200 exhibits, and inasmuch as participation in the show is by invitation only and there are something like 2200 concerns eligible, the task of the show committee in filling this space is a delicate one. It aims to have the show thoroughly representative of the various types of service machinery and equipment, so the selection of exhibitors will be with this end in view.

With such an experienced promoter as Samuel A. Miles in charge of the show, it is expected that the display will be of an educational nature that cannot help but benefit the 1000 or more factory service managers and engineers, distributors

and dealers and their service managers and shop superintendents who are expected to attend the convention.

Working with Mr. Miles in the show promotion work is an advisory committee made up of W. M. Webster of the Automotive Equipment Association, M. L. Heminway of the Motor and Accessory Manufacturers Association and S. D. Black of the Service Equipment Association.

Paris Show Will Precede London by Only Few Days

PARIS, Feb. 26 (by mail)—Passenger cars, motorcycles, bicycles and all accessories will be admitted in the first of the two Paris shows, to be held in the Grand Palais this year, the date being Oct. 2 to 12, inclusive.

At the second show, opening on Oct. 22 and closing on Oct. 31, trucks, stationary engines, garage tools and machine tools will be exhibited.

While the Paris show will still be the first of the European series, the fact that there will be only four days between the closing of this exhibition and the opening of the London show will necessitate the preparation of two sets of show models.

The experiment of opening the show in the evening, made two years ago and abandoned last year as unsatisfactory, will be repeated next October on two Friday evenings only. The French public refuses to carry its interest in a trade exhibition beyond 6 p. m.

Ford to Double Output at Omaha Plant in 1924

OMAHA, March 5—Plans provide for the assembling at Ford's Omaha plant this year of more than double the number of cars and trucks assembled here in 1923. The plant will be enlarged within the next sixty days.

While the plans call for the assembly of 160 cars a day, the enlarged plant will give a capacity for 310 daily. The number of unskilled laborers will be augmented by 700, and the monthly payroll will be increased from \$75,000 to \$145,000. The new employees will start at 62½ cents an hour, but after three months their wages will go to 75 cents.

Last year the plant received 3468 carloads of material and shipped 5420 carloads of finished products. There were also many driveaways of cars and trucks.

New equipment will make possible the assembly of closed bodies here for the first time.

Ford Plans for Norfolk

NORFOLK, VA., March 1—The Ford Motor Co. has completed plans to place on the market specifications for the construction of its \$2,000,000 assembly plant here.

It is expected the plant will be ready for operation in the early summer and will employ 500 or more men. The site is located on deep water front, and this fact has given rise to the belief that Norfolk will be used by the company as one of its export centers.

Majority of Farmers Own Motor Vehicles

Government Survey Shows Highest
Percentage Is in States
of Far West

WASHINGTON, March 4—The first comprehensive survey of the farmers' use of automobiles has been completed by the Bureau of Agricultural Economics, United States Department of Commerce, showing the widespread use of the automobile and motor truck among the present-day farmer.

Of necessity, the survey could not cover the whole of the United States, but carefully selected areas were chosen, and it is from these that the Department has gathered and compiled data showing the relation that the automobile and truck play in the farmers' existence.

Middle West Percentage High

In the Atlantic Coast areas 58 per cent of the farmers have automobiles. In different areas in the Middle West 70 to 85 per cent own cars, while in Washington and Idaho 86 per cent of the farmers have adopted this improved method of transportation. The only region where less than half the farmers owned automobiles was in the dry farming wheat area, which has suffered financially since 1917, and which is reflected in the number of automobiles owned on the farms in those regions.

The survey shows that in Pennsylvania 58 per cent of the farmers possess a passenger car or truck; Kansas, 85 per cent; South Dakota, 70 per cent; Montana, 48 per cent; Colorado, 85 per cent, and Washington and Idaho, 86 per cent.

The figures indicate that the phaeton is the farmers' car for all-around use, from hauling milk or feed to transporting children to and from Sunday school picnics. In all areas two-thirds or more of the cars reported were phaetons. Next to the phaeton, trucks were most used, running up to about to one-fourth of all motor vehicles in some areas, though less important in others. Roadsters, sedans and coupés were less frequently reported, rarely totaling one-tenth of all vehicles.

Over two-thirds of the cars reported were of makes now priced less than \$500, f.o.b. factory, for phaetons.

Used for Farm Business

Most of the service of these farm-owned cars was devoted directly to farm business, such use being estimated by farmers in the different areas at two-thirds to nine-tenths of the total use. With the annual cost of operation amounting to between \$200 and \$300, the cost of the car for pleasure use averaged from \$50 to \$100 per year.

The average prices paid for cars varied in the different areas with difference in the proportions of the different types. That of the phaeton was about \$700. The average length of life estimated for phaetons varied from seven to eight years.

Men of the Industry and What They Are Doing

Harvey T. Wheelock Resigns

Harvey T. Wheelock, for several years advertising manager for the Velie Motors Corp., has resigned and will be manager of the Dean Motor Co. of Rock Island and Moline, of which he is president. The Dean company handles several county agencies for the Velie as well as the Rock Island field for the Maxwell and Chrysler cars. Mr. Wheelock has been associated with the Velie corporation since the first Velie was produced. He served as manager of an agency in Kansas City from 1909 to 1912. In the latter year he handled the truck sales division until the war contracts flooded the plant and in 1916 became advertising manager.

Burritt Succeeds McMunn

Henry W. Burritt, secretary and treasurer of the Gray Motor Corp., also has been made general manager, succeeding W. N. McMunn, who has resigned. Mr. Burritt became identified with the Ford Motor Co. in 1906 and when he resigned in 1921 he was in charge of Ford tax matters all over the world. He joined Gray in 1922.

Light Manages Root Co. Office

John K. Light, for years associated with Joseph N. Smith & Co. of Detroit, has been installed as manager of the Detroit offices of the Root Co. of Bristol, Conn., maker of automatic counters, automobile and miscellaneous hinges, stampings, etc., with most of the product going to the automotive industry. Mr. Light will devote most of his energies to hinges for automobile hoods and windshields.

Squires Director of Service

John Squires, for the last three years assistant chief engineer for Maxwell Motor Corp., has been appointed director of service for Maxwell-Chalmers and Chrysler.

S. H. Hilleboe Transferred

S. H. Hilleboe has been transferred from the Dallas branch of United Motors Service to the general offices of the company in the General Motors Building, Detroit.

Wade Is Michigan Representative

Charles E. Wade has been appointed Michigan representative for the Howell-Hinchman Co., Middletown, N. Y., manufacturer of leather upholstery.

Danzig Distributor Here

Henry Czaplicki, representing the Stutz car and Indian motorcycle as distributor in Danzig, Poland, territory, is visiting his principals in this country. Mr. Czaplicki has two branches and eleven sub-dealers distributed among a population of 63,000,000. He is optimistic over business conditions in his

country because of the stabilizing of currency. Danzig and Lithuania are now using only gold and silver, and Poland and Upper Silesia will follow suit by the first of April.

Suit for Receivership Filed Against Wharton

DALLAS, TEX., March 5—Suit against the Wharton Motors Co. asking for a receivership and an injunction to restrain the management from disposing of any of the properties belonging to the company has been filed in district court here. A temporary injunction has been granted, and the hearing on the case set down for March 8.

The suit also asks damages to the amount of \$200,000 against Thomas Wharton, president of the company, Thomas P. Whitten and L. Heckman. The suit alleges that Wharton spent \$200,000 of the company's money without authorization of the directors. Seven stockholders appeared as plaintiffs in the suit.

Wharton Motors Co. was organized under the laws of Delaware in 1920 with a capital stock of \$5,000,000, of which \$420,000 was paid in. It purposed to manufacture different models of automobiles and trucks, airplane engines, etc. Wharton Motors Co. of Texas was capitalized at \$50,000, all paid in, the plaintiffs allege.

Morgan Manufacturing Receivership Sought

KEENE, N. H., March 5—Stockholders of the Morgan Manufacturing Co., manufacturer of automotive accessories, on Feb. 29 filed a bill in equity against the company and attached the real estate of the company and its president, Bernard C. Morgan. They ask to have a receiver appointed and the company's assets distributed among the stockholders proportionately. The seventeen stockholders who signed the petition live in various places in New England.

A second bill in equity and attachment in the sum of \$50,000, have been filed against the same defendants in favor of Jackson C. Minge, financial manager, together with injunction proceedings, to prevent Mr. Morgan from disposing of his interests. The company is incorporated under Delaware laws. It is said that 32,011 shares of common and 7057 shares of preferred stock have been issued.

FORDS IN INDIANAPOLIS RACE

INDIANAPOLIS, IND., March 4—The Barber Warnock Co., Ford dealer here, whose entry in the last Memorial Day race aroused considerable interest, has announced that this year it will have three Ford racing cars in the big classic.

Couzens' Aid Sought Against Gooding Bill

Freight Traffic Managers Oppose Amendment to Interstate Commerce Act

DETROIT, March 3—Freight traffic managers of the automobile industry, members of the National Automobile Chamber of Commerce, at a meeting here decided to wire Senator Couzens, member of the Senate Committee on Interstate Commerce, invoking his aid in defeat of the Gooding bill that proposes more rigid application of that section of the interstate commerce act known as the long and short haul clause.

Disputes as to making under certain conditions lower rates to more distant points are now subject to investigation and decision by the Interstate Commerce Commission. It is believed the Gooding bill would make this more difficult. The general feeling among commercial interests is that competition among carriers would be restricted by the proposed law.

Alfred H. Swayne, vice-president of the General Motors Corp., addressed the meeting on the financing of railroads and pointed particularly to the difficulty of financing of late years by stock issues and to the material improvement in railroad conditions noticeable during the past year.

A. T. Waterfall, vice-president of Dodge Brothers, discussed operating conditions, with particular reference to the automobile car supply and the requirements of the industry during the coming year.

Reports indicate that the industry is likely to repeat during the next few months the extensive shipping of January, which exceeded previous records in the number of freight cars used for automobile shipments.

Dividend Checks Sent to Liberty Creditors

DETROIT, March 4—Dividend checks to creditors of the Liberty Motor Car Co. have been mailed by the Security Trust Co., receiver. Secured claims totaling approximately \$400,000 have been paid in full. Creditors whose claims originated subsequent to January, 1922, were paid 98 1/5 per cent. General creditors whose claims did not fall in the preference under the creditors' agreement received 17.3 per cent. Unsecured claims totaled about \$1,400,000.

A portion of the receivership funds is held under court order pending disposal of a Government claim which is expected to be cancelled. This fund is small, but will give preferred creditors about 100 per cent if made available.

European Countries Increase Inquiries

Indications Also Point That Russia Is Being Reached by American Producers

NEW YORK, March 3—Currency stabilization and improved economic conditions have brought Central and Eastern Europe into greater prominence as automotive export fields, and within the last few days a large number of inquiries and visiting dealers have been received here from these countries. With the reported lifting of import restrictions into Germany, some exporters have been fairly deluged with requests for information concerning possible sales arrangements in that country.

Russia, following various rumors in particular reference to the Ford line, is being more seriously considered, and, while the situation there will probably be clouded with uncertainty for a long time, there are evidences that some penetration by American lines has already begun.

European Competition Keen

The extent of the possible automobile business throughout these sections of Europe and extending down into the Balkan states can scarcely be gauged by any of the standards now applied to other export markets.

European competition is exceedingly keen, particularly from such makers as Fiat, Berliet, Renault, Rolls-Royce and several other lines, which are granting either long credit or virtual consignment terms. But some American makers have had considerable sales, comparatively speaking, and an evident desire to obtain American lines is finding an expression in various ways.

New currencies, based on gold or silver and with metallic coins, are reported by travelers as either being put into circulation or planned for the immediate future. The Dawes commission, according to trade information, may reach a temporary or permanent solution of the reparations problem, with the expected result of lessened tension and stable currency in Germany.

Motor Transport in Balkans

In the Balkans, it is said, significant changes have been brought about by the general after-war readjustments and motor transport is being introduced, along with the beginning of highway improvements. Many of the refugees from the Turkish territories are engaged in road building and similar public work in Greece. Some of these refugees who brought their wealth with them to their new homes have become either actual or potential automobile buyers. Recent visitors to this country from Greece describe the outlook from their standpoint as being promising, although, of course, it is not to be expected that large sales are in the making to that territory.

American lines were introduced to many parts of Europe through the armies or by sales of war stocks. Also a few of the American companies have representation in the larger cities and have sold some vehicles right along, particularly to citizens who had returned from America. Credit competition from the European makers is admittedly the chief handicap at present, but this has been met in certain instances by the American lines.

The Scandinavian countries, together with Spain, are regarded as the most important outlets for American vehicles in Europe. Tax restrictions in Denmark are militating against sales this year, and the depreciated currency in Norway is another handicap, but a bright outlook is ascribed to Sweden.

Chevrolet Gives Views on Possible Price Rise

DETROIT, March 3—C. E. Dawson, sales executive of the Chevrolet Motor Co., has sent the following message to all dealers and associate dealers, defining the company's position on possible price increases:

This question is being asked daily (are prices to increase) by Chevrolet dealers who have noted price increases by various manufacturers.

These increases appear to be caused by steadily rising cost of material.

So far we have been able to offset our increased material cost by increased economies resulting from larger production. How long we can continue to do this we don't know.

While we have every desire to hold the strong price position we now enjoy, no dealer is safe in assuming that we can do so indefinitely if material costs continue to rise.

We, therefore, advise our dealers to urge all prospects as well as buyers who have made deposits against future deliveries to take their cars at once. They lose nothing by such action and may save money.

Vesta Batteries Mount 10 Per Cent in Price

CHICAGO, March 1—An increase of 10 per cent in the price of storage batteries to dealers, announced today by the Vesta Battery Corp., is said by officials of the company to be due to the rapid rise in the market price of lead since last October. Other battery companies have announced increases of 5 per cent or more in the last few weeks.

Lead is selling at 9 to 9.50 today, whereas six months ago the price ranged from 6.15 to 6.40. This rise has added \$1.22 to the manufacturing cost of a Vesta Ford battery, according to officials of the company, and the increase in price to the dealer covers only 88 cents of that.

PRICES OF OAKLAND CARS

Price increases of the Oakland line, as announced in AUTOMOTIVE INDUSTRIES of Feb. 14, were in error in that the list on the coupe was given as \$1,445, whereas the increase was \$50 instead of \$100, making the present price \$1,395. The sedan also was advanced \$50, to \$1,445. The price of the roadster and phaeton is \$995.

Road Show Planned for Pan Americans

Tour of States Also Being Arranged for Those Attending Meeting in U. S.

NEW YORK, March 4—With the appointment, of delegates to be announced this month, plans are maturing rapidly for the Pan American Highway Mission meetings, which will be held in this country for about twenty-five days, commencing in late May or early June.

Under the direction of S. T. Henry, who will manage the meetings in behalf of the Highway Education Board, arrangements for the tour are being made, and it is assured already that the delegates will be shown actual highway and motor transport activities in ten southern, eastern and middle western States, in which topographical and agricultural conditions are much similar to those encountered in the Latin American territories.

38 Official Representatives

The official delegation will consist of thirty-eight representatives, who are being selected from the various countries because of their specific work in connection with local road building campaigns. Although no announcement has been made as to the individuals who are being appointed from each territory, it is understood that they embrace government officials, business men, engineers and representatives of automotive associations.

Various organizations in this country are supporting the meetings and cooperating with the Highway Education Board, the Pan-American Union, the Inter American High Commission and the Department of Commerce. Among these organizations are the National Automobile Chamber of Commerce, the Motor and Accessory Manufacturers Association, the Rubber Association of America, the Association of State Highway Officials, the American Road Builders Association, the Asphalt Association and the Society of Automotive Engineers.

Will Open in Washington

The meeting will open in Washington, D. C., with a one-day session and appropriate opening entertainments. Then, by train, the delegates will be taken to North Carolina, where five or six days will be spent inspecting the highways.

Arrangements are being completed to hold in one of the larger centers what will virtually be a highway building show, with demonstrations of actual construction and other features. The next State to be visited will be Kentucky, following which will be Indiana, Illinois, Iowa, Minnesota, Wisconsin, Michigan, Ohio, Pennsylvania and New York. With the exception of two sections, practically all the traveling will be done by automobile.

USED CAR SALES SITUATION VARIES

Toledo

TOLEDO, March 4—The outlook for automotive dealers in this territory is very good for March. Sales in the last month have run along somewhat better than in the same time a year ago, but deliveries have been slower. Dealers have many unfilled orders on hand.

The buying public has a feeling that the shortage of cars is past and that it can walk in any time and get the car wanted. Dealers say that situation is true to a certain extent, but they look for a rush as soon as the first few days of real motoring weather sets in.

The used car situation is good. Stocks have been piling up for the last few weeks, and at the present time they are the highest they have been in nine months, but movement is expected soon. None of the dealers has much frozen investment in used cars.

Indications are that farm demand for motor cars will be heavier this year than for some time, and the demand is expected to show itself in the next two months.

Birmingham

BIRMINGHAM, ALA., March 4—Dealers are optimistic over the business outlook for spring, although many of them are heavily stocked at present and buying has been slow on account of bad weather. The weather is improving, however, and will probably bring a brisk spring demand that will take all available cars within a few weeks.

The used car is still the paramount problem in Birmingham. The demand is very small. Local dealers who have contracts that compel them to take a certain number of new cars are in a position where they are being forced to take very small profits on deals where a trade-in is accepted. Dealers who have contracts where no certain number of cars are specified are going very slow on deals which involve any used cars.

Alabama farmers are in a mood and position to buy farm equipment to facilitate the raising of the bumper crop of cotton which they are planning this year. They have more money than they have had in previous years, and they are planning to buy more light tractors and trucks than they have been taking.

Milwaukee

MILWAUKEE, March 4—Events during February, which was beset with the worst variety of extreme weather conditions known in Milwaukee and vicinity in years, served to confirm the hopes that retail trade in passenger cars in the early part of 1924 will be at least as good as ever before, and generally better. At the same time the development of the motor-bus business, and a materially improved general business situation, gave rise to renewed hopes that commercial vehicle trade this year is going to outstrip that

of any year outside of the wartime period.

At the beginning of March the stocks of passenger cars in the hands of local dealers ranged anywhere from light to large. A note of optimism that has a substantial basis runs through the local dealer trade. In practically every instance the remark is made that winter business has been better than was looked for, and that measures taken to get an accumulation of cars fall short of demand as it has developed.

It is not correct to assume from statement made by various dealers that people are falling all over themselves to buy cars. This is not the case. On the other hand, buying of new cars has been very good, especially since the Milwaukee annual show late in January. It is probably worthy of note that the majority of buyers are accepting the price views of dealers with respect to the trade-in value of their old cars, and these are doubtless more circumscribed than ever before, because none of the dealers want to risk losses on resales of used cars merely for the sake of selling the new ones.

The used car trade during February has represented an advance over the average for this month, and stocks are generally reported to be "comfortable."

Detroit

DETROIT, March 4—Detroit dealers are looking to March to open up spring deliveries, not sales, for sales have been good since the first of the year, but weather conditions have tied up practically all deliveries and dealers have not begun to move their winter stocks. There is no doubt anywhere but that spring sales will compare with any season that has gone before and may be better, but the fact remains that deliveries in this section have been slow up to now.

Dealers are in good shape with regard to used cars. Stocks are low and have been found readily movable at low prices. The increases in the new car prices in the past month have helped make used cars attractive, dealers report, and have made it possible to get better prices than would otherwise have been the case.

An unusual and unlooked for resistance to sales is reported by some dealers as being due to balloon tires and tire companies are coming in for some criticism for featuring balloon tires advertising at a time when most car manufacturers are building cars whose wheel equipment does not permit of balloon tire use.

Conditions throughout the State are reported as promising a large spring buying. Shows in all cities have been largely attended, despite storms which have been unusually severe. Much of the farmer attendance has been kept down for this reason, but nevertheless the farm element has been largely represented.

San Francisco

SAN FRANCISCO, March 4—February buying of cars was heavier than in any previous year, with prospects that sales in the San Francisco territory will set a new record for March. The three coast shows have been an important stimulus to buying, and the usual delay in buying, due to the desire to escape tax day in March, has not been in evidence this year. Dealers expect the influence of the shows to carry through March and April. They made more sales at the San Francisco show than ever before and also obtained more good prospects.

Few if any of the dealers have any amount of stock on hand, and a number are planning to go personally to the factories in March in an effort to obtain more cars. Used cars of the better grades, reconditioned by the dealers in each make, are in good demand. The wholesale situation is improving, and dealers expect record business in the next three months.

Philadelphia

PHILADELPHIA, March 4—Dealers in this territory are thoroughly optimistic over the spring outlook for trade. The holdover stocks are well cleaned up, and already there are about as many new models in salesrooms and warehouses as there were a year ago this time, with promise of considerably larger takings in not a few instances.

Inquiries and current purchases indicate that car owners are in a buying mood and have the money to spend. In the rural localities conditions are such as to permit an unusually hopeful forecast for spring and summer purchasing.

Less difficult and more reliable financing plans in some instances will aid in making car purchases more attractive, it is reported. The used car situation here cannot be said to have improved materially.

Accessory dealers complain of having large stocks of winter goods on hand which they have been unable to move because of the open winter.

Cleveland

CLEVELAND, March 4—Sales of automobiles in this city increased gradually during February. Records in the office of the county clerk, where all automobile transfers and transactions are recorded, disclose 7810 records of sales and transfers made in February. This compares with 5800 in February of last year.

The used car market is better than it was a year ago. Stocks are said to be below last year's figure.

With general business conditions favorable, retailers of automobiles look forward to a volume of sales for the immediate months that will exceed what was done in the same months last year.

REPORTS DIFFER ON FEBRUARY TRADE

New York

NEW YORK, March 4—Passenger car sales for the early weeks of 1924 are running ahead of 1923 in the metropolitan area. January registrations of new cars in ten counties in and around New York, as compiled by Sherlock & Arnold, publisher of the Automobile Sales Analysis, were:

1924.....	3840
1923.....	3115

February registrations for the first half of February aggregated 1897 as compared with 3381 for the whole month last year.

In New Jersey, according to the same authority, passenger car registrations for the entire twenty-one counties aggregated 8866 in January and in the same period motor truck registrations totaled 2505.

New York and vicinity distributors generally called February, this year, a "normally dull" month, with bad winter weather and disturbed conditions in the stock market contributing factors. Some dealers have been running behind last year, but others have run about even and others considerably ahead, with an aggregate gain as a result.

St. Louis

ST. LOUIS, March 4—Dealers are preparing for the expected large increase in sales with the opening of spring by stocking enough cars to be able to make immediate deliveries. However, not as many cars are being stored as in previous years because the expense of storing eats too heavily into the dealers' profits.

Conditions in the rural communities surrounding St. Louis and comprising the St. Louis distributing territory are better than for some time. Especially is this true of the mining districts in southern Illinois, where the settlement of various troubles has created a good field for the sale of cars. It is expected that the demand from the country will be larger this spring than for several years.

Stocks of used cars in dealers' hands now are large, but have been reduced somewhat by intensive selling campaigns the past month.

Indianapolis

INDIANAPOLIS, March 4—Indianapolis and Indiana have passed the lowest of the down grade and expect a very steep rise in both retail and wholesale sales during March, which for ten years has been the big month of the early season.

February out of the way, all dealers and distributors are happy, for not in a decade has February failed to mark the very bottom of sales records in Indiana.

Some dealers and distributors have felt a very brisk livening of the demand for cars in the last week or ten days, but the earlier parts of the month just passed lived up to the keenest expectations of those dealers who are not afflicted with dreams.

Lines with new cars and especially moderate prices for new types did very well last month, in spite of the general and expected slump. In several cases wholesale business during the last ten days went ahead of the usual February. Practically all of these orders were for cars to be delivered during the early part of this month.

The general outlook for State business is better than at this time last year, according to most reports. Some financing companies report February collections from 40 to 50 per cent better than those of a year ago, thus confirming in a measure the optimism felt by the dealers and distributors.

Boston

BOSTON MASS., March 4—Motor car sales showed a bit of a slow-up during early February in the Boston territory, but they picked up in various outside sections. The result is that dealers entered March with greater anticipation of big business than ever. A number of the larger retailers have cars stored, but many others have no very large stock. In the outside territories business has been good because of local shows.

Los Angeles

LOS ANGELES, March 4—Dealers handling the most popular lines of cars claim undoubtedly there will be a shortage in spring deliveries. Comparatively few of the fast-selling lines are represented in warehouse stocks. Even now deliveries on some models are delayed as much as thirty days. There seems to be practically no diminution in the demand. This has enabled some of the dealers to put a check on trade-ins in a way that could not be accomplished before.

A few dealers positively refuse to accept trade-ins, but offer to take the cars on consignment and sell them, permitting the amount received to be applied against the purchase of a new car. Disgruntled because of their inability to make what they regard as satisfactory trades, some owners prefer to retain their old cars, which is the nearest approach ever reached here to the plan of wearing out cars.

The used car market is only fairly brisk. There has been an increase in the number of replevins. Some dealers attribute this to the slump in the real estate market, as many of the repossessed cars had been sold to real estate salesmen who now are unable to meet the payments.

Minneapolis

MINNEAPOLIS, March 4—With the formation of an agricultural corporation to aid Northwestern banks which are in trouble over frozen credits, automobile men are looking forward to better business. The corporation has available \$110,000,000 for loans, and will take care as far as possible of banks that will be able to go on after a little aid.

Distributors of low priced cars are particularly optimistic over the prospects for spring business and are stocking as fully as they are able to finance shipments. In the cities, inquiries have been better the last two weeks due to signs of a mild spring.

Probabilities of good sales this year are indicated by the survey of the Federal Reserve bank, which has found that in the three States entirely in the Ninth District, Minnesota and the Dakotas, the increase in the last year in automobile holdings as compared with population has not kept pace with that in other sections of the country.

These States, which held first, sixth and eighth positions in 1920, have dropped to seventh, sixteenth and fourteenth places. With the increase of diversification in crops, gain in dairying and gradual return to prewar prices for farm products, these States will offer a good field for automobile sales.

Columbus

COLUMBUS, OHIO, March 4—Dealers and distributors in Columbus and central Ohio territory are well pleased with the outlook for spring business. This is most striking in lines which sell from \$600 to \$2,000. The few warm days at the end of February caused business to expand, with the result that business in February was far ahead of that of February of last year, although better weather prevailed a year ago.

Farmers are showing a tendency to come into the market, but their business is always somewhat later than the city demand and not a great deal of trade from the strictly rural sections is expected at this time. Closed models still have the call, and the demand ranges from 50-50 in certain lines to about 85-15 per cent in others.

Used cars are selling better and are bringing fair prices. The used car market is almost wholly a weather proposition, and with pleasant days the accumulation of used cars is expected gradually to diminish.

Stocking for the spring trade is going on briskly. Dealers selling lower priced cars have much larger stocks on hand than at this time last year, and others are making preparations to get cars as needed. Extra warehouses have been leased, and financial arrangements have been made in many instances to handle an extra large stock.

FINANCIAL NOTES

Maxwell Motor Corp., ten-year 7 per cent convertible sinking fund gold debentures, totaling \$5,000,000, due March 1, 1934, and priced at 98, to yield about 7.30 per cent, are being offered by Blair & Co., Inc. The debentures are being offered subject to prior subscription rights of stockholders, which expired March 1. A convertible feature in the loan contract provides for their conversion into Class A stock of the corporation at \$75 a share. Proceeds of the sale will be used to redeem the Series C notes of the corporation, which have been called for redemption. On payment of these notes the debentures will constitute the sole funded debt of the corporation.

Corduroy Tire Co.'s balance sheet for the year ending Dec. 31, 1923, shows total assets of \$2,567,433, with current assets of \$1,040,194 as compared with liabilities of \$109,415, or total liquid assets of \$930,779. Current assets show cash, \$98,400; accounts receivable, \$286,857, notes receivable \$373,302, miscellaneous stocks and bonds, \$5,100 and merchandise inventory, \$276,533. Current liabilities include \$90,646 for accounts payable and \$18,768 for accrued expense.

Columbia Motors Corp. current assets and liabilities as shown in the balance sheet of Dec. 31 are \$1,413,149 and \$755,566 respectively. Assets include cash of about \$50,000; sight drafts and warehouse receipts for cars shipped, \$136,000; receivables, \$180,000; inventories, \$1,000,000. Liabilities include approximately \$385,000 in bank loans; \$140,000 in notes payable to merchandise creditors, and \$185,000 in accounts payable.

Chicago Yellow Cab Co., the operating concern, showed a net profit of \$2,071,252 for 1923, which is equal to \$10.35 a share on 200,000 no par shares which were outstanding until December, when a 100 per cent stock dividend was declared. This compares with \$1,773,072 in 1922. After payment of \$4 a share, \$1,271,181 was carried to surplus, which now stands at \$2,315,994.

Motor Products Corp., for the year ended Dec. 31, 1923, reports profits for itself and its predecessor company of \$2,633,411, after Federal taxes. The predecessor company, operating from Jan. 1 to Dec. 10 last, had net profits of \$2,586,166, leaving \$47,245 for the new company from Dec. 11 to 31. In 1922 the company had a profit of \$1,400,617 before Federal taxes.

General Aluminum & Brass Manufacturing Co. shows a net profit for 1923 of \$225,616, which compares with \$26,683 in the year previous. After dividends the company transferred \$105,016 to surplus which now aggregates \$482,074. Cash totals \$24,953 and receivables \$318,247. Current liabilities are \$212,868.

C. R. Wilson Body Co. reports net profits of \$1,086,073, after all charges and Federal taxes, for the year ended Dec. 31, 1923. After allowing for the 7 per cent preferred dividend, this is equivalent to \$4.75 a share, par \$10, on the outstanding 200,092 shares of common.

Jordan Motor Car Co. has declared a quarterly dividend of 75 cents on the new common stock, payable March 31, to stock of record March 15. The regular quarterly dividend of 1 1/4 per cent on the preferred also was declared.

Mack Trucks, Inc., has declared the regular quarterly dividend of \$1.50 a share on the common and \$1.75 a share on the first and second preferred stock issues, all payable April 1 to stock of record March 20.

Timken-Detroit Axle Co. has declared the

regular quarterly dividend of 1 1/4 per cent on the preferred stock, payable March 1. Books closed Feb. 20 and reopened March 3.

Stromberg Carburetor Co. has declared the regular quarterly dividend of \$2 a share on its capital stock, payable April 1 to stock of record March 10.

Electric Auto-Lite Co. reports January net earnings of \$223,634, which is its best January since 1920.

Makers Showing Caution in Factory Operation

(Continued from page 584)

ahead of February output. Reo is continuing at 150 cars and speedwagons daily and will increase this total as it gets into operation in the former Duplex plant.

Cadillac continues to approximate the 100 daily mark, which represents practically plant capacity. Packard schedules have been revised somewhat because of increased demand for the single-eight, although the six continues to dominate production. Rickenbacker has scheduled 1800 cars for March or at the rate of 75 daily, which will be a 50 per cent increase over February. Dort schedules are for about 60 daily. Wills Ste. Claire has 600 cars scheduled for March, about 100 per cent more than February output.

The Durant plant at Lansing will operate on a schedule of about 400 cars daily, the Star being the large production vehicle. Gray schedules are for about 3500 cars in March. Columbia was building about 15 daily when taken over by the new executives, who plan to increase this schedule by a considerable figure during the month.

A. T. Waterfall Better Following Car Accident

DETROIT, March 5—Arthur T. Waterfall, vice-president and assistant general manager of Dodge Brothers, who was severely injured in an automobile accident last Saturday, is reported making steady recovery at the Harper Hospital, though his condition is still a matter of concern. It will probably be several weeks before he will be sufficiently recovered to leave the hospital.

Mr. Waterfall was injured when his car and another crashed near his home. He was unconscious when he was removed to the hospital, where examination showed that he had suffered a fracture of the skull and injuries about the body. He recovered consciousness shortly after arriving at the hospital. Because of the nature of his injuries, he is being kept extremely quiet.

DR. WILDER LEAVES HOSPITAL

DETROIT, March 5—Dr. G. E. Wilder, sales and advertising manager of the Gemmer Manufacturing Co., who has been ill with influenza for several weeks, has recovered to the extent that he has been removed to his home from the hospital, but it will be several weeks before he will be able to resume his business activities.

BANK CREDITS

Written exclusively for AUTOMOTIVE INDUSTRIES by the Guaranty Trust Co., second largest bank in America.

General trade continues in large volume, although irregularity is still the outstanding feature. A rather sharp divergence is noticeable between the construction and apparel trades. Further recessions in commodity prices occurred last week, cotton and copper being conspicuous examples.

Car loadings in the week ended Feb. 16, despite the partial suspension of activities on Lincoln's Birthday, attained a new high record for this season of the year, numbering 935,109 as against 906,489 in the preceding week and 816,646 a year ago.

Production of crude petroleum during the week ended Feb. 23 averaged 1,888,400 barrels a day, comparing with 1,918,900 in the preceding week, and 1,784,700 in the corresponding period last year. Total production in January was the lowest since February, 1923, while stocks on hand declined for the first time in a year.

Revised figures of foreign trade for January show exports of \$395,170,129 and imports of \$293,788,573, leaving an export balance of \$101,381,556. The excess of exports to Europe amounted to \$114,653,012, which is \$38,331,041 less than in the preceding month, but \$28,636,852 more than in January last year.

Fisher's index of wholesale commodity prices stood at 151.8 last week, after recording three successive declines from the year's high of 155.2 on Feb. 9. Bradstreet's food index was \$3.29 against \$3.34 for the preceding week.

Federal Discounts Increased

Discounts by Federal Reserve banks increased \$35,500,000 during the week ended Feb. 27, the bulk of the gain being in bills secured by Government obligations.

Loans of reporting member banks declined \$9,030,000 during the week ended Feb. 20. Loans secured by Government obligations fell off \$9,000,000, while an increase of \$31,000,000 in loans secured by stocks and bonds was offset by an equal decline in "all other" loans. Investments rose \$10,000,000 and time deposits \$44,000,000, while net demand deposits declined \$168,000,000.

Call loan rates were slightly firmer last week, ranging from 4 1/4 to 5 per cent, while time money was maintained at 4 1/4 to 5 per cent.

S. A. E. TO HEAR ROAD TALKS

NEW YORK, March 4—Walter L. Kidde and Major W. G. Sloan, commissioner and engineer respectively of the New Jersey State Highway Commission, will present facts and plans on highway construction and maintenance in their State at the meeting on Thursday evening, March 13, of the Metropolitan Section, Society of Automotive Engineers, to be held at the Automobile Club of America.

Motor Bus Accepted as Railway Adjunct

No Longer Considered Rival to
Electric Roads, Says Asso-
ciation President

ST. LOUIS, March 4—Recognition of the motor bus as an ally and not a rival of the electric railway was officially made today at the annual mid-year conference of the American Electric Railway Association by President Britton I. Budd of Chicago.

Mr. Budd declared that his industry need have no fear of competition from automobiles. He said that the electric railway has proved itself to be the cheapest and most efficient means of carrying the masses in the cities and will continue to render that service.

In his remarks he said:

For a number of years everything that ran on rubber tires was regarded as a bugbear by the electric railways. Experience has demonstrated, though, that for mass transportation the gasoline-driven vehicle cannot supplant the electric car.

We have very properly accepted the motor bus as one of the necessary adjuncts of our transportation business. We are rapidly becoming acquainted with its uses as one of the tools of urban and interurban transportation and are coordinating it with our electrically propelled cars.

The general public is no longer looking to the individual, and many times irresponsible operator, for bus service. It is looking for bus service to the well established and responsible railway company.

Reports submitted showed that 1923 was the best year the electric railways ever had, 16,000,000,000 passengers being carried. This traffic is increasing at the rate of 500,000,000 passengers a year, and to take care of the growth the electric railway industry will require additional capital amounting to \$175,000,000 a year.

Detroit Exchange Lists

Stocks of C. G. Spring

DETROIT, March 5—Common and preferred stocks of C. G. Spring & Bumper Co. have been listed on the Detroit Stock Exchange. The report to the stock exchange shows that the company was organized three and one-half years ago by Christian Girl. In 1922, its first manufacturing year, company sales were \$1,200,000 with profits of \$120,000. In 1923 sales were \$3,680,000, with earnings of \$306,000. The company reports sales in the first quarter of the 1924 fiscal year as far in advance of the similar quarter in 1923.

The company's original capital was \$241,000 in preferred and 8241 shares of no par value common stock. Present capital is \$693,300 in preferred and 134,810 shares of no par common. Earnings of the present common stock are about \$2 a share. The company is now operating unit factories for the manufacture of

bumpers in Chicago, Kalamazoo, Detroit and Cleveland, with capacity for 6000 a day. Sales this year are expected to show an increase of 50 per cent over last. Common stock outstanding Feb. 25 of this year amounted to 134,810 shares.

INDUSTRIAL NOTES

Pawling & Harnischfeger Co. of Milwaukee has gained much-needed steel casting capacity by the acquisition of the entire assets and plant of the Hercules Steel Casting Co., that city. The Hercules foundry was built only a few years ago and contains a 10-ton electric melting furnace. It has been idle about six months, pending liquidation under receivership proceedings. Overhauling is now under way and the Pawling company expects to resume the operation about April 15 or May 1.

Wisconsin Wagon Co., a pioneer vehicle manufacturing concern of Madison, Wis., has changed its name to Wisconsin Auto Body Co. It has specialized in the manufacture of commercial car bodies for several years and also conducted an extensive business in repainting, enameling and trimming passenger car bodies, building California tops, winter enclosures, etc. The facilities are now being extended and parts of the old wagon factory remodeled and retooled for larger production.

Belle City Malleable Iron Co. of Racine, Wis., has completed the first half of its \$800,000 plant replacement and enlargement program and is now employing 500 men. Work is divided principally between automotive and railway contracts and orders. The second half of the improvement is now being undertaken and when completed about a year hence, the force will be increased to 800 or 850. The capacity will be increased more than 100 per cent in all.

Steel Wheel Co., exclusive representative of the Motor Wheel Corp., of Lansing, Mich., has moved its offices and warehouse in New York to 507 West Fifty-sixth street, where it has established a service station for repairing steel wheels now in use and for the installation of small-diameter wheels for low pressure or balloon tires.

Pressed Metal Co. has been organized in Pawtucket, R. I., by Dutee Flint, Darius Goff, R. W. Reid and others to manufacture Ford fenders. Mr. Flint is Ford distributor in Providence and operates his own steamer for the purpose of bringing Ford cars from the Kearny plant to Providence.

Warren Foundry Formed to Make Piston Castings

WARREN, OHIO, March 4—The Warren Foundry Co. has been incorporated for \$150,000 to manufacture piston castings for the automotive industry. Frederick B. Whitlock of Cleveland, president and manager of the Interstate Foundry Co. and also a director of the Sterling-Knight company, will be president. Edward W. Beach, well known because of his connections with the Manufacturers Foundry Co. of Waterbury and the Ferro Machine & Foundry Co., will be vice-president and manager.

The company has taken over the land and buildings previously occupied by the Warren Metallic Bed Co. The plant, which will be in operation by June.

METAL MARKETS

Lacking substantial developments, the market for steel products has fallen a prey to sentiment. In the absence of any movement of prices that would furnish tangible indication of a change in conditions all sorts of remote arguments are advanced to prove that the market has suddenly veered in its course. Absence of predictions of higher prices is interpreted as foreboding declines. Undoubtedly producers have increased operations considerably during the first two months of the year, and the demand for steel in general has failed to keep pace with this increase.

Perhaps also the ease with which producers accomplished this speeding up of output furnishes a ready argument to from-hand-to-mouth buyers that there is no need for altering their purchasing methods. With the exception of the automotive demand for steel, that from most other consuming industries has been and continues to be disappointing. For all that, however, nothing has happened in the last few weeks to warrant the sudden pessimism encountered in some quarters. It is certainly going far afield to drag in the Teapot Dome scandal as an explanation for the change in steel market sentiment.

Even if such legislative investigations should tend to dampen the ardor for enterprise and expansion of some corporate interests, it is certain that the current steel demand has not been affected. On the whole, the change in sentiment appears to be emotional rather than based on the actual slowing up of buying. If March should prove a light month for steel orders, price cutting would not come as a surprise. On the other hand, if the demand shows some improvement, what little price shading is now in evidence will disappear. Full-finished automobile sheets, however, are in a class by themselves, and the market for this automotive specialty may be characterized as firm, with a sufficient backlog of orders on rollers' books to give reasonable assurance of a continuation of this condition throughout the first quarter. Non-integrated sheet rollers, whose number has increased of late, are reported to be contemplating the erection of a sheet bar mill in the Mahoning Valley, so as to emancipate them from dependence upon the larger interests for their semi-finished material.

Pig Iron.—Blast furnaces and sales agencies have had to back water on the higher prices they began asking a month ago. What buyers are in the market are in a position to dictate their own price for halfway representative tonnages. Automotive foundries generally have enough pig iron on hand for the current month's melt.

Aluminum.—Good-sized tonnages of ingots continue to arrive from Norway, but virtually none of this metal is for sale. While most of the large automotive consumers of aluminum are fairly well covered for their requirements during the year's first half, smaller users continue to experience difficulty in picking up odd lots as they need them. Secondary metal, remelted as well as new scrap, is in steady demand at high prices.

Copper.—London quotations rose last week on reports from this side that American producers contemplated curtailment of output, and New York quotations went up on receipt of the London cable. Everyone is happy to see copper come into its own, but not on quite so flimsy and transparent a maneuver as this.

Calendar

FOREIGN SHOWS

- March 14-23—Geneva, International Motor Exhibition, under the auspices of La Chambre Syndicale Suisse de l'Industrie Automobile.
- April 2-13—Barcelona, Automobile Exposition, under the auspices of the Confederacion de Camaras Sindicales Espanolas del Automovilismo y Ciellismo, Palacio de Arte Moderno.
- Aug. 23-Sept. 6—Toronto, Ont., National Automobile Show in conjunction with the Canadian National Exhibition under the sanction of the Canadian Automotive Equipment Association and the Automotive Industries of Canada.
- Oct. 2-12—Paris, passenger cars, motor cycles, bicycles and accessories, Grand Palais.
- Oct. 17-25—London, Annual Passenger Car Show, Olympia.
- Oct. 22-31—Paris, motor trucks, stationary engines, garage tools and machine tools, Grand Palais.

RACES

- April 24—Fresno.
- April 27—Trapani, Italy, International Automobile Race.
- May 30—Indianapolis.
- June 14—Altoona.
- July 4—Kansas City.

- Aug. 3—Lyons, France, European Grand Prix.
- Sept. 1—Syracuse.
- Oct. 4—Fresno.
- Oct. 19—Kansas City.
- Nov. 24—Los Angeles.

CONVENTIONS

- March 31-April 4—New Orleans, Annual Spring Meeting of the Automotive Equipment Association.
- May 19-22—Detroit, National Automotive Service Convention and Maintenance Equipment Show, under the auspices of the Service Division of the National Automobile Chamber of Commerce, General Motors Building.
- May 21-24—Detroit, International Motor Transport Congress under the auspices of the National Automobile Chamber of Commerce.
- June 3-4—Detroit, Midsummer Meeting of the Automobile Body Builders Association, Hotel Statler.
- June—Washington, Pan American Highway Congress, under the auspices of the Pan American Highway Mission.
- Sept. 22-26—Boston, Sixth Convention and International Steel Exposition of the American Society for Steel Treating.

S. A. E. MEETINGS

- March 11—Pennsylvania Section, Balloon Tires and Riding Quality, J. E. Hale, Kugler's Restaurant, 34 South Fifteenth Street, Philadelphia, 8 p. m. Dinner, 6.30 p. m.
- March 11—New England Section, Road Illumination, R. E. Carlson, Engineers Club, Boston, 8 p. m. Dinner, 6.45 p. m.
- March 13—Metropolitan Section, Highways for Motor Traffic, W. L. Kilde, W. G. Sloan, Automobile Club of America, 247 West Fifty-fourth Street, New York City, 8 p. m. Dinner, 6.30 p. m.
- March 14—Mid-West Section, Joint Meeting with Milwaukee Group, Four-Wheel Brakes, Demonstration, W. S. James, 3 p. m. Dinner, Milwaukee Athletic Club, Milwaukee, 6.30 p. m. Meeting, 8 p. m. A. Y. Dodge, Four-Wheel Hydraulic Brake Co. representative.
- March 17—Cleveland Section, Traffic Control, Major Mark Ireland, Cleveland Hotel, Cleveland, 8 p. m. Dinner, 6.30 p. m.
- March 20—Detroit Section, Recent Developments in Per-

manent Mold Castings, D. H. Meloche, General Motors Building, Detroit, 8 p. m. Dinner, 6.30 p. m.

- April 2—Milwaukee Section, The Future Passenger Car, C. W. Pendock, chief engineer, Le Roi Co.
- April 3—Detroit Section, Chassis Lubrication, F. H. Gleason, General Motors Building, Detroit, 8 p. m. Dinner, 6.30 p. m.
- April 15—New England Section, Chassis Lubrication, F. H. Gleason, Engineers Club, Boston, 8 p. m. Dinner, 6.45 p. m.
- April 17—Metropolitan Section, Fleet Maintenance, F. Winchester.
- May—S. A. E. Motor Transport Session, New York City.
- May 15—Metropolitan Section, What Roads and Steels Do to Automobiles.
- June 24-27—Summer Meeting of the S. A. E., Spring Lake, N. J.
- Oct. 21-24—S. A. E. Production Meeting, Detroit.
- Nov. 18-19—Joint Service Meeting of the S. A. E. with the N. A. C. C. Cleveland.
- Aeronautical Meeting at Dayton at the time of the Pulitzer Races.
- January—S. A. E. Annual Meeting, Detroit.

28,261 French Cars Exported Last Year

PARIS, Feb. 23 (by mail)—Record figures of 28,261 passenger cars exported, with a value of 730,337,000 francs, were attained by the French automobile industry for the year 1923, these being an increase of 102 per cent on the number of cars and of 81 per cent in value, compared with the year 1922.

The greatest volume of business was done with Great Britain, the other countries in order of importance being Belgium, Algeria, Spain, Switzerland, Germany and the Saar district, all of these showing important increases. A drop compared with the previous year was reported in the exports to the United States and to Morocco.

One of the notable features of the year's business is the increase from 151 to 1679 cars sold to Germany. All this increase took place during the last few months of the year, the exports for November being 186 and for December 501 cars.

Truck and tractor exports dropped from 3846 in 1922 to 2663 last year, the value being 81,864,000 francs. Uniting all types of vehicles, French exports last year covered 30,924 automobiles, valued at 812,201,000 francs. Automobile imports into France totaled 8400 passenger cars during 1923, an increase of 164 per cent compared with the previous year.

Of this total the United States furnished 7264, of which a very large proportion were Fords; Italy followed with 967, and Belgium-Luxemburg with eighty-six. All other countries sent in-

dividually less than forty. Truck and tractor imports totaled eighty-five, of which forty-one came from the United States.

Basis for Import Duty Changed in Argentina

WASHINGTON, March 3—Import duties on automobiles to Argentina in the future will be collected on the basis of the list price as published in American trade periodicals plus 10 per cent, converted at the normal rate of exchange, according to a cablegram received by the Department of Commerce.

The Department was advised the first of this month, that, effective Feb. 2, import duties on automobiles would be based on the factory price, plus freight and insurance, converted at the current rate of exchange. The amended import duties, the Department is advised, will save the importer the 10 per cent tax on the freight and insurance, the duty being based solely on the advertised price.

Michelin Wins French Highway Damaging Case

PARIS, Feb. 23 (by mail)—Condemned by the police courts for having damaged national roads by carrying out tire tests on them, the Michelin Tire Co. of Clermont-Ferrand lodged an appeal and carried the case to the Supreme Court, which has just given its decision quashing the judgment of the lower court.

The action was taken on a decree issued by the Prefect of the Allier district forbidding chassis testing on public highways.

Business in Mexico Progressing Slowly

MEXICO CITY, Feb. 23 (by mail)—With the backbone of the revolution broken, but with guerrilla warfare continuing in some sections, all commerce is going ahead slowly and carefully.

However, if the government secures any of several loans now being negotiated, among them one of \$25,000,000 from the American Tobacco Company for land concessions between Pachuca and Tampico, business should commence to ease up as these funds will be put quickly into circulation. The government owes merchants and employees probably 20,000,000 pesos, and this has a great deal to do with the present economic crisis.

Restoration of confidence is of prime importance, as without this essential requisite credits will remain tight, which will restrict expansion and even current operations. Much merchandise has been tied up at Vera Cruz for some months; due both to strikes and to the revolution, and this has greatly affected trade. With traffic to Vera Cruz opened, this situation should change.

Automobile prospects have not been buying, except the most needed equipment, and much of this has been on credit. As credit has been difficult, not much has been sold.

DUTCH FAVOR RESTRICTION

NEW YORK, March 5—London reports that private advices credit Dutch rubber growers with having voted in favor of the principle of restriction of production of crude.